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ORIGINAL ARTICLES

PRESIDENT'S ADDRESS*

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I DEEPLY appreciate the honor you have done me in electing me president of the European Orthodontological Society for 1930. At the same time I feel that I have not earned so great a distinction in the work of this Society itself. The fact that it meets, as it should do, in the various countries of Europe, renders it difficult to attend the meetings with regularity. I thus feel the honor more considerable from the fact that I have not been a regular attendant at the Continental meetings.

It would not be perhaps inappropriate to consider for a moment the value of such a Society as this. Its breadth of membership, embracing as it does all European countries recognized professionally, its catholicity of composition, its breadth of view in regard to all matters relating to the practice of our specialty can only make for good in the enlightenment of the individual and the greater consideration for the work of others both individually and collectively.

Contact with our fellow men must always enlarge our horizon, contact with our fellow workers must always teach us consideration for their aims, ideals and difficulties.

We have in our individual lives, spent in busy practice under the present extraordinarily difficult economic conditions, our own problems to solve, but when we meet the other fellow, we get to know him personally. However well we may have known him by reputation, we find in the personal touch a common ground of professional ideal, an earnest and sincere desire to help, and our vision is broadened in an endeavor to approach the difficulties from some other point of view. It is thus that I am led to hope that such a Society as this, small as it is at present, will continue to spread its influence, widen its sphere, and help, as

* Read before the 1930 Congress of the European Orthodontological Society at Zurich.

it must, in the encouragement of the practice of our specialty. We, as orthodontists, are deeply indebted to our American confreres. They have largely cleared the way and blazed the trail to present ideals and methods. This very rapid development of specialization in almost all branches of medicine and dentistry may and doubtless does have its dangers, but may it not be that this stage has been reached largely as the result of enthusiasm and an earnest desire to help. With our older customs, our different methods of education, it is difficult to disturb existing conditions, and change must come by a more gradual demand from public opinion and experience, where centuries have taught it is difficult to make rapid and extreme change. Building anew from modern foundations, both of thought and custom, does not constitute the problems the older countries of Europe have to solve. Nevertheless, the existence of such a Society as this brings to one's notice the very real interest in a world-wide problem which is not limited to an individual country, and it is to such facts that I place the exceeding value which such intercourse appreciates. Thus it can only be an honor offered in the great good fellowship of a common feeling of professional good-will that can place an individual in the place I occupy today.

What work can the European Orthodontological Society accomplish which is particularly associated with national difficulties?

In 1926, at the first International Orthodontic Congress, an endeavor was made to come to agreement on the question of nomenclature. This was not unanimous but there is hope that a broader view may be taken in the near future. The present methods of classification are somewhat chaotic in their variations and render it difficult to discuss, teach or solve problems on a common basis—a simplification of a working general nomenclature of classification would go far to widen the interest of the dental profession.

As individuals and as a Society, we must tender our grateful thanks and appreciation to all those workers in the studies of physiology, biology, anatomy, technical work and the many varied studies and help them by our gratitude and criticism to their encouragement.

Occupying this position one is expected to say something of interest to members and of value to the profession, and I find it extremely difficult to choose a subject for this purpose. It will be obvious to you that one's horizon is limited by one's environment. I am thus led to take as my subject for this address, the English attitude towards orthodontic practice compared, not so much with the Continental attitude, but with that of our American confreres. During the past twenty-five years dental surgery has been passing through many phases, both politically and professionally, and at last in England we have secured a position of legal security founded on a temporary but very real sacrifice. Under these circumstances it should be possible for the profession to realize its responsibilities, towards both the great public and itself. Up to the present time specialization in practice does not exist in England, and the attitude of the British public is still markedly conservative, and the professional man is expected to have a complete knowledge of every branch of his subject. Research has revealed the enormous possibilities attending the practice of every individual branch of our profession, and these possibilities increase with the advent of knowledge. At the present time orthodontics is perhaps the one subject which is calling more for

specialization and intensive study than any other branch of dentistry. How are those who are responsible for the training of students to fulfill their obligations in fitting the young practitioner in this subject? The English attitude towards orthodontic practice is one of quiet criticism and a somewhat superior attitude towards this subject. At the same time one knows that all practitioners are desirous of acquiring a high technical efficiency in the work they do, and the liability of any antagonism rests largely with the teachings of the past. It is only reasonable to suppose that while opponents of orthodontic practice as carried out on the most modern lines have some basis for their opposition, they do realize the urgent necessity of some care and treatment for the great masses of children suffering from malocclusion. One can only suppose that conditions are generally similar throughout Europe; specialization has not arrived. A recent visit to the United States has shown me possibilities of organization where unanimity may, or can, exist between individuals working in private practice. This can be carried a step further in the treatment of children under forms of government or municipal dental service. Whatever methods of actual practical correction may be adopted, it should be possible for organized school clinics with operators working individually in sessions to accomplish much work if they were able to agree on the lines of technical treatment to be adopted. This makes for much speed in handling large quantities of children. I do not wish to convey the idea that America has solved this problem, but some individuals have solved their own problem of handling large numbers of children in private practice by the acquisition of a technic in which three or more individuals are perfectly efficient and familiar, with the consequence that the amount of work done in an ordinary day is considerably greater than what could be proportionately accomplished by the same number of individuals working separately. There is no greater unanimity of treatment, of diagnosis, of agreement of etiologic factors in America than there is in any other part of the world, but having once decided on the line of treatment to be adopted, unanimity of operation comes in by teamwork, with the remarkable benefit and the saving of time to the child and the operator. Such lessons as can be learned in this way from observation could very effectively be brought into our clinic practices in England once the matter had been properly and thoroughly absorbed.

The great responsibility of teaching students at the present time is rather overwhelming from the fact that so little time in the various curricula can be allowed to the student's practice of orthodontics; the consequence is that only a more or less elementary knowledge is gained during his student career. This may be all to the good, but there should be facilities for the acquisition of further knowledge granted by the varying academic bodies. I am not alone in pointing out the desirability of some means of acquiring this knowledge, but so far the matter has not ventured beyond the expression of more or less pious opinions. The necessity for the treatment of large numbers of school children under the varying municipal bodies of the country, shows a field of opportunity for study and practice which hitherto has been unavailable. The recognition by the medical authorities of the necessity for this treatment being undertaken should open up for the young practitioner material which can be thoroughly organized and which would provide him with sufficient material for conscientious study, both

of which would be for his own good and that of his patient. The dental schools can do little more than they are doing at present. The fact that the student's practical surgical curriculum is completed in two years, at once shows the impossibility of his conducting difficult and involved treatments, or of observing developments during the time taken in the completion of a permanent denture, so that we come to the question of postgraduate practice. This is an urgent necessity; in England there are no means of acquiring this knowledge. The schools could establish an interchange of teachers which might help during the student's ordinary time at hospital, and it should be possible for the establishment of postgraduate teaching to be undertaken in different centers by the recognized teaching bodies of those anxious to take them. The Dental Board, which is the governing body of the dental profession, has made some advances in postgraduate teaching, but they have been exclusively and definitely academic, and on the lines of anatomic research. A great value attaches to this work. Whether it is in the sphere of such a body to offer the organization of postgraduate teaching I cannot say, but if not, and if the schools think it is outside their field, then it seems to me the matter must remain as it is or be left to individual and private enterprise.

SOME THEORIES OBSTRUCTING THE PROGRESS OF THE SCIENCE OF ORTHODONTIA*

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WHEN one assumes to criticize recognized methods of practice in any branch of science, and suggests wherein he believes certain theories are erroneous, he must naturally have proofs to back up his assertions. The work necessary to obtain such proofs in this instance covers a long period of time, as well as keen observation for many years previously to ascertain that something was wrong in our methods of treatment of malocclusion, as evidenced by the great amount of at least partial failure.

In discussing a paper by Dr. Paul W. Simon,[1] Dr. Jos. Eby said: "Knowledge is gained through the process of elimination of theories or their conversion into facts."

A large number of men have been endeavoring for years to solve some of our orthodontic problems, working from so many angles that the literature upon the subject has now become so voluminous that it will only be possible in the time allotted for this presentation to mention a few of the opinions expressed. It is quite evident, however, that progress is being made, as will be apparent when a few results of treatment by different operators are outlined, and the opinions of these and others cited. That some, at least, of the prominent workers in this field have forsaken, more or less, the theory that mandibular teeth are ever distal to their normal relation to the base in Class II cases (Angle), I have no doubt. It is apparent that several investigators are gradually arriving at the same conclusion, viz., that teeth drift forward, not only in the maxilla, but also in the mandible. Fig. 1 shows that in this case practically all the teeth have tipped forward.

The chief theory which will be discussed at this time is the long-standing one that in the treatment of cases belonging to Angle's Class II, those of so-called distoclusion, the mandibular teeth must be carried forward, as well as a distal movement of the maxillary teeth. To accomplish this movement the Baker anchorage was hailed as a panacea, and this method is still in general use by possibly the large majority of practitioners.

The idea that the mandibular teeth in these cases are distal to their normal position in relation to the main body of the mandible is one of the most colossal mistakes that has been made in orthodontic diagnosis. The literature is teeming with the results of this error, as indicated by the published reports of treated cases, showing that by the use of intermaxillary elastics, and sometimes bite plates, not only the mandibular incisors and canines, but often the premolars and molars, have been tipped forward to an abnormal angle of inclination in relation to the base. Many cases of this type are as-

*Read before the 1930 Congress of the European Orthodontological Society, at Zurich.

sociated with an excessive overbite. Upon removal of appliances, after treatment by this method, the mandibular incisors endeavor to regain their normal angle of inclination and, therefore, crowd more or less; the excessive overbite, where it existed, also becomes reestablished. To overcome this difficulty, the bite plate came into vogue. Thousands of youthful patients all over the world are condemned to wear these *splints* at night for the rest of their lives to *support* the teeth in the abnormal positions in which they have been placed by unscientific orthodontic treatment. In a small percentage of cases treated by this method the mandibular incisors will remain in this protruded position, but in these they do so as a result of a large or strong tongue and loose muscles of the lips, or the absence of normal functioning of these muscles as a result of abnormal respiration.

Many orthodontists claim that they find no particular difficulty in correcting and maintaining the teeth in Class II cases, but rarely do these operators report their results several years after the removal of appliances. If the normal mesiodistal relation of the cusps of the teeth has been established in treatment, some of these men seem to feel that later crowding of the mandibular incisors and canines is a minor detail of no particular importance, and can be attributed to the eruptive forces of the third molars.

This crowding of the mandibular incisors, after treatment, impressed upon me several years ago that something must be wrong with our methods and impelled me to endeavor to find the cause. The original result of this research[2] was published in 1922, but, after further work, some changes in technic of construction of appliances were made, which very much improved their efficiency in stimulating nature to produce the result sought. This later report[3] was more definite, and was presented in 1925. Up to this time I believed to be correct the opinion expressed by Angle[4] on page 46 in the seventh edition of his book, where he says: "Not only are all of the lower teeth effectually locked in distal occlusion in these cases, but the mandible is also distal in its relation to the maxillae and usually smaller than normal." Holding this view at that time, I had developed what I called the "Buccal Planes" (Fig. 2), which are a modification of the old "Plane and Spur," in order to stimulate nature to establish a lengthening of the mandible. This method has proved very successful, and is excellent procedure where the mandible is short, but today I believe that the majority of these cases are maxillary protrusions. This further light was just dawning upon me in 1926 when I presented a paper before the orthodontic section of the seventh International Dental Congress. At that time it was not quite clear in my mind as to just what percentage of these Class II malocclusions presented a short, or undeveloped, mandible. Different names have been given to this condition by Lischer,[5] Simon[6] and Federspiel. The latter applied the name "mandibular retroversion," but I have not a record of where this was first mentioned in the literature about 1912. However, Federspiel, in discussing my paper,[3] before the American Society of Orthodontists, in 1925, where the use of buccal planes was advocated to stimulate nature further to develop the mandible, said: "I don't want you to go away thinking that I am inclined to criticize Dr. Grieve's method of treatment. No doubt, his method is all right if his diagnosis is

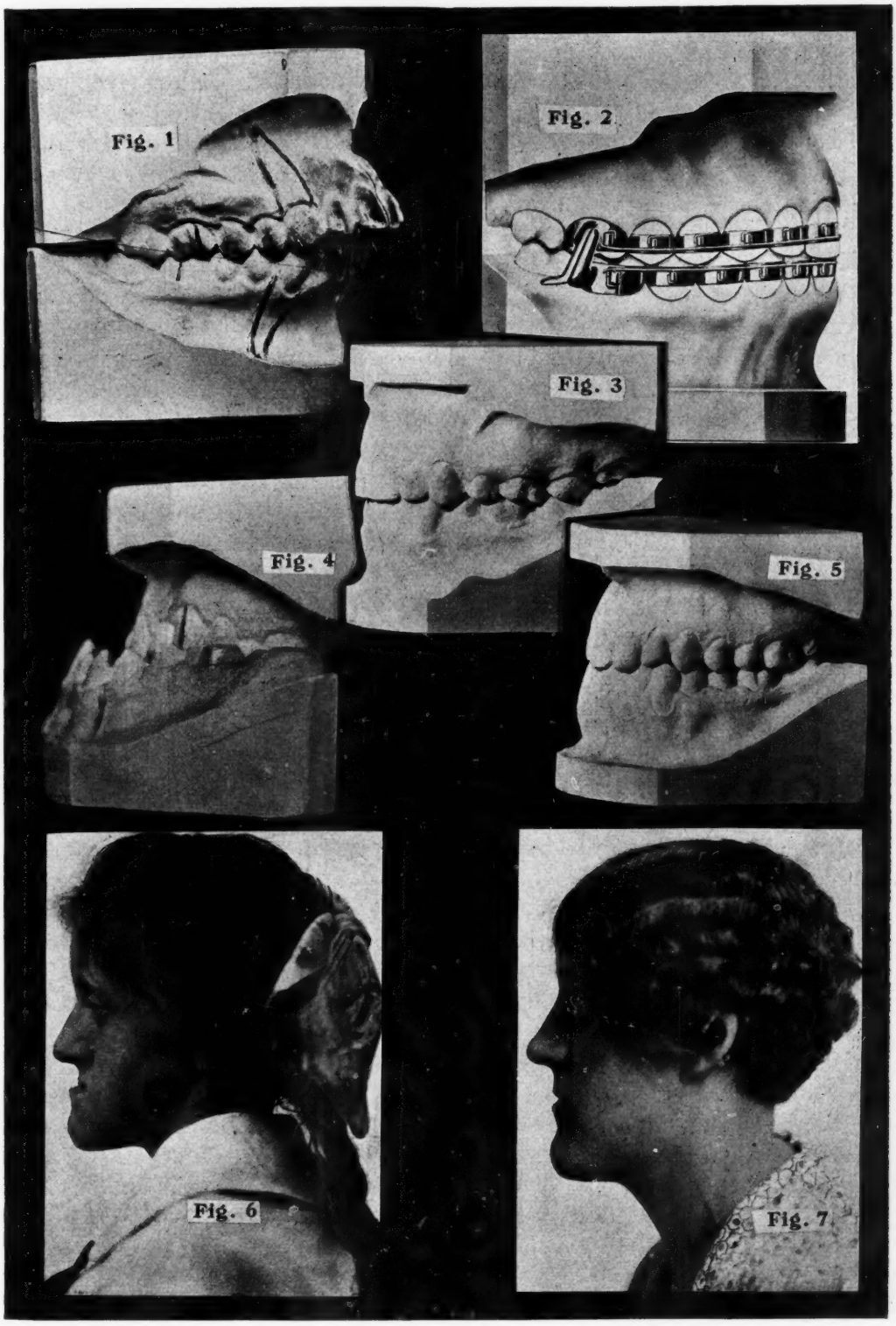
Fig. 1
Fig. 2
Fig. 3
Fig. 4
Fig. 5
Fig. 6
Fig. 7

correct, but I would like to have him differentiate between a 'distoclusion' and a 'mandibular retroversion.' '' Simon[6] uses the term ''mandibular retraction,'' and his method of diagnosis of this anomaly is possibly the most positive one yet presented, though very much criticized. I, however, believe that a careful study of the casts and the profile of a patient by one who has had considerable orthodontic experience will fairly well establish this point. No particular harm, however, would result from a little overdevelopment of the mandible to counterbalance a slight maxillary protrusion which, for any reason, had not been corrected by carrying back the maxillary teeth. Fig. 3 shows casts, one year after the removal of appliances, in a case where four premolars have been removed. This was a Class I malocclusion, where both maxillary and mandibular teeth had drifted forward somewhat as a result of premature loss of deciduous teeth in both arches and absence of normal lip pressure. In the original there was also a little too much overbite. The treatment had been carried on (without extraction), using intermaxillary elastics and pin appliance, to a point where, under recognized correct procedure, retaining appliances would be placed. At this period I had come to realize that in this case (as well as many others in this Class and also in Class II) some, if not all, of the teeth were too far forward originally, and in treatment had not been carried back to their normal relation to the apical base. Experience had proved that a satisfactory result was impossible under these circumstances, so all first premolars in the case shown were removed at this time, this being one of the first instances where I did this. In the subsequent treatment sufficient anchorage was not utilized in either jaw to ensure carrying back the anterior teeth to what was believed to be their normal position, as this procedure was new to me, and I did not realize the amount of anchorage necessary. The mandible was normal, but as there still existed some slight maxillary protrusion after the spaces were closed, buccal planes were placed for a short time to stimulate nature to bring about a slight lengthening of the mandible to compensate. The maxillary canines, as you see, were not sufficiently intruded, either. This fact, coupled with a still slightly mesial position of the mandibular teeth in relation to the base, accounts for a very little crowding of the anterior mandibular teeth and just the least narrowing of that arch. However, no retainers were placed, nor would they have been of any avail. I believe that if cases are properly treated no retention is required, provided normal lip pressure is established. Notwithstanding the errors in technic in this instance, all will agree that this is a very satisfactory result.

In the paper[7] which I presented before the Dental Congress in 1926, I discussed the first root-moving appliance of Dr. Angle[8]—the pin and tube, and made some reference to its use in my practice from the time of its introduction in 1910. It is desired here to quote a paragraph from that paper, concerning diagnosis, as I am today more convinced than ever of the truth of the statements made therein: ''Diagnosis is probably the most important factor in orthodontia. If we err in this, we cannot expect to succeed in treatment. I believe that the most constant trend of the migration of teeth is forward, and that many of our difficulties in treatment have been due to a lack of realization of this fact. This mesial drift of the teeth is often asso-

ciated with a lack of lateral growth of the bones. The tendency is for the teeth to tip, rather than to move forward bodily, although the latter condition is often found. In my opinion, only in a very small percentage of cases do we find the canines, premolars and molars distal to their normal position upon what Lundström[9] has called 'the apical base,' except in the maxillae in cases of Class III (Angle)." At the time that declaration was made I really believed that teeth were rarely, if ever, distal to their normal position in relation to the apical base in any class of malocclusion, except possibly where there was mutilation, missing tooth germs, or something of that nature, but was not yet prepared to be so dogmatic as to go on record to that effect. I am now ready, however, to take that stand, and shall here endeavor to call attention to the work of other authors to show that I am not alone in this belief. Some of those who will be quoted are not so definite as I in their statements, but, nevertheless, the work of many investigators would indicate that a realization of this fact is gradually dawning upon some, at least, of the members of the orthodontic profession.

To Dr. Edward H. Angle is due more credit than to any other man up to the present time for the work he has done in the development of the science of orthodontia. That he believes, with me, that teeth do not occupy, "in a very large percentage of cases," a distal position to normal in relation to the apical base is evidenced from the following quotation from his most recently published paper:[10] "You all know that in addition to the usual irregular cusp relationships, there is found in a very large percentage of cases of malocclusion a more or less abnormal tipping or leaning forward of many or all of the teeth on either or both sides of one or both dental arches, and often, also, a slight bodily drifting forward of their normal positions. These conditions may, of course, be found in cases of all classes, divisions and subdivisions of malocclusion of the teeth."

In 1925, the INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY AND RADIOGRAPHY carried an article reprinted from *Svensk Tandlakare Tidskrift,* 1923, by Dr. Axel F. Lundström,[9] entitled "Malocclusion of the Teeth Regarded as a Problem in Connection With the Apical Base." In this paper, Lundström voiced the opinion that the apical base could not be enlarged, and attributed many of the failures in orthodontic treatment to efforts to accomplish this. He says: "When the latter (the apical base) is normal, and only then, is a normal position and a normal occlusion of the teeth possible." He further says: "A dental arch cannot be normal in form unless there is a definite relation between the coronal and the apical curve, the relation being dependent upon the type of tooth in question." Lundström's idea that the apical base could not be enlarged was probably conceived as a result of his own failure and that of others to maintain teeth which, in treatment, had been carried beyond the apical base as a result of faulty diagnosis and an effort to stimulate nature to build bone in the alveolar area over the roots, as is being done constantly by many operators, particularly by the use of the lingual wire and intermaxillary elastics. The too common error is that of endeavoring to expand dental arches laterally and anteriorly beyond the normal limit. Stimulation by mechanical means, when properly applied, will bring about an

increase in the size of the maxilla in an anteroposterior direction, as is quite evident from Figs. 4, 5, 6 and 7, a case which I reported in a paper[7] nearly four years ago. Figs. 8, 9, 10 and 11, taken from another of my papers,[3] would indicate that some lengthening of the mandible, also, has taken place. It would, therefore, appear that increase in the size of the apical base can be brought about by properly directed stimulation. Lundström[9] criticizes Angle's former idea of apical expansion.[8] The latter's more recent work[10] would indicate that he has changed his ideas somewhat in this respect, and rightly so. Lundström[9] says finally: "The ingeniously devised attempts at expanding the entire apical base by means of orthodontic appliances must be considered to a great extent to have been failures." In speaking of the crowding of anterior mandibular teeth, after treatment, in some of his own cases of Class II, he says: "It seems possible that it is a direct consequence of the mesial movement of the teeth of the lower jaw. If so, this movement has not managed to influence the apical base to the same extent as it has moved the teeth, or, in other words, the apical base has not been able to follow the teeth."

I have been very much interested in this work of Lundström, because it would seem that he had called attention to a very important problem, but did not seem to have clearly seen the way out of the difficulty.

We must turn to a man who is not an orthodontist—Dr. J. Sim Wallace[11] —to obtain a more definite description of what really takes place in malocclusion. In his book, *Variations in the Form of the Jaws,* published in 1927, there are many statements, based upon keen observation during a long experience, which I feel bears out my own contention that malocclusion is due chiefly to a forward drift of the teeth. Wallace's opinion is that nature does not increase the size of the maxilla and mandible by building bone in the alveolar area over the roots of the teeth (the too common idea), but at the back.

Under the heading "Post-Natal Development of the Jaws," Wallace says: "Details apart, it would appear that the growth of the mandible in man has been as well described or illustrated by John Hunter as it has ever been described or illustrated since, and here we may give his description of the growth of the jaws from birth onwards: 'The jaw still increases in all points till twelve months after birth, when the bodies of all the six teeth are pretty well formed, but it never after increases in length between the symphysis and the sixth tooth; and from this time, too, the alveolar process which makes the anterior part of the arches of both jaws never becomes a section of a larger circle, whence the lower part of a child's face is flatter or not so projecting forwards as in the adult.'

" 'After this time the jaws lengthen only their posterior ends, so that the sixth tooth, which was under the coronoid process in the lower jaw and in the tubercle of the upper jaw of the fetus, is at last—viz., in the eighth or ninth year—placed between these parts, and then the seventh tooth appears in the place which the sixth tooth occupied with respect to the coronoid process and tubercle, and about the twelfth or fourteenth year the eighth tooth is situated where the seventh tooth was placed. At the age of 18 or 20 the eighth tooth is found between the coronoid process in the lower jaw and under or

somewhat before the tubercle in the upper jaw, which tubercle is no more than a succession of sockets for the teeth till they are completely formed.' " (See Fig. 12.)

Wallace says further, under the same heading: "We know that teeth can be moved by mechanical forces, but we know of no force which pulls the

first molar backwards." He also notes that the tongue varies in size and that it "influences to some considerable extent the breadth and the shape of the dental arches." Under the heading "Antero-Posterior Growth of the Jaws," he says: "It may further be said that all the evidence goes to show that, but for minor adjustments due to the different sizes of the permanent teeth, the

position which they occupy in relation to the jaws is essentially that which the temporary teeth occupied before they were shed." Wallace says further: "We have seen that the permanent teeth in the mandible normally come to occupy the position which their predecessors held in the dental arch (allowing for minor adjustments and a certain broadening), but when crowding or irregularity or proclination of the incisors takes place, we are justified in premising that the first molar tooth has moved forwards corresponding in amount to the diminution in size of the alveolar arch from molar to molar." Under the same heading he says: "Indeed, *all*, or almost all cases of crowding result from the forward translation of the molar teeth." He states that "the crowding and irregularity of the front twenty permanent teeth must result almost entirely from lack of sufficient growth behind the original temporary arch and forward movement of the first permanent molar." In the last reference which I shall quote from this author, he says: "Whether the size of the jaw is sufficient to allow of the eruption of the permanent molars depends not on insufficient growth of the part of the jaw which carried the temporary teeth, but on insufficient backward growth of the lower jaw and insufficient absorption of bone on the anterior aspect of the ramus. A corresponding lack of bony deposit on the maxillary bones posteriorly accounts for the teeth in front of the erupting molars being pressed forward."

Strang[12] also called attention to the tipping forward of the teeth, and advocated the tipping back of these teeth, but warns against imprisoning mandibular third molars. He, however, suggests the use of the mandibular teeth as anchorage in carrying back the maxillary teeth, which I believe is a fatal mistake. In Strang's figures 10 and 11, showing a finished result, there is no doubt but that the teeth are still too far forward, and in this type of case, also, I feel that extraction is often indicated (providing the third molars are present), or the use of extraoral anchorage—possibly both.

I am quite convinced that Barnes,[13] in a paper before the American Society of Orthodontists, in 1922, expressed the generally recognized opinion at that time, and that which is apparently still held by many, where he says: "Orthodontic treatment is to a very great extent the expansion of the dental arches." Further he says: "When expansion is obtained by massing the teeth of the right side against those of the left, there is greater opportunity for really expanding the fundamental bone and thereby providing more tongue room, better muscle placement and stress, and room for crowded teeth without taking that space from teeth farther posterior. Even with this rational expansion, it is too often still impossible to move all the teeth far enough forward to relieve impaction of the third molars or even the second molars in many cases." Barnes' idea in this instance seemed to be centered upon gaining expansion, both laterally and anteriorly, in order to prevent third molar impactions, and, notwithstanding this, often found it necessary to remove second molars to permit the third molars to erupt. In many of these cases reported it was quite evident that the mandibular teeth had been carried forward beyond the apical base, and naturally dropped back and crowded after removal of appliances. In the treatment of one case he says: "Great resistance was met in the mandibular bone and it was found impossible to move in-

cisors and cuspids forward except by tipping, therefore the uppers had to be moved back with intermaxillary force to meet what could be held in the lower."

In practically all the cases reported by Barnes at that time, the mandibular incisors, after the removal of appliances, crowded in a manner typical in this type of treatment. The chief point which I wish to make is that teeth are not too far back in relation to the base in any type of malocclusion. With some individuals the mandible may be short, but we cannot obtain any appreciable lengthening of that bone by "hauling" the teeth forward with elastics or tipping them forward with incisor planes or bite plates.

The late Dr. Calvin S. Case[14] many years ago advocated, in the treatment of certain types of maxillary protrusion, the removal of two maxillary "bicuspids," for which he was very severely criticized. He found that after the use of intermaxillary elastics in these cases there was relapse. He also went so far as to advocate, in some cases of "upper retrusion," the carrying forward of the eight anterior teeth and bridging an additional tooth between the premolars, which latter procedure was, of course, absolutely wrong. However, in a paper[15] which he presented in 1920, he sounded a warning concerning the use of intermaxillary elastics, which, had it been investigated scientifically then, might have saved many years of "groping in the dark." Case did not at that time, apparently, sense the real difficulty, but it is evident that he was on the way to it. It would seem that his idea was that the difficulty in postmaintenance of the teeth in these cases after treatment was due to disturbing the mesiodistal relations of the buccal teeth.

Several writers have called attention to this forward drift of teeth, but there has been too much antipathy to the suggestion of removing any teeth as a means of overcoming the difficulty, and those who did advocate extraction in Class II cases resorted to this expedient only in the maxilla. So far as I know, I was the first to advocate the removal of two teeth from the mandible, as well as two from the maxilla, in this type of case, except those who advised removing third molars, or second molars to relieve impaction of third molars. Case,[14] however, advocated removal of four "bicuspids" in bimaxillary protrusions.

If teeth have drifted forward of their normal relation to the base, they must be carried back to their normal positions. This I endeavored in many cases to do, but found it very difficult, if not impossible in some cases, with the additional danger of imprisoning the third molars; the amount of time necessary, also, to accomplish such movement often makes it impracticable.

It has been suggested that the number of instances where tooth germs are missing possibly indicates an effort upon the part of nature to decrease the amount of tooth material, and it seems evident that in numerous individuals at this time there is not developed a bony structure sufficiently large to accommodate thirty-two teeth.

This forward drift of the teeth seems to be the general tendency, accompanied often by too much vertical growth in the anterior region, producing an excessive overbite, which condition I believe is more or less responsible for a great deal of the periclasia and destruction of alveolar bone overlying the

roots of anterior teeth which periodontists are called upon to endeavor to correct. In many individuals with excessive overbite, who have undergone orthodontic treatment, a normal overbite has not been maintained, because of the common erroneous method of treatment before mentioned, but a normal overbite can be established and maintained, without the use of bite plates or planes of any type except in those cases with a short mandible, in which type buccal planes would be indicated. I at one time advocated a certain type of incisor planes,[2, 3] but I long ago abandoned them in favor of the more efficient buccal planes[3] and a better technic for correcting excessive vertical growth in the anterior region.

In conclusion, I desire to stress what I have endeavored to make the main theme of this paper, viz., that, in my opinion, teeth ordinarily do not occupy, in either maxilla or mandible, a position distal to their normal relation to the main body of the bone in which they are situated, and that a lack of realization of this fact has been responsible for much of the difficulty and more or less failure in the treatment of malocclusion.

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MECHANICS VERSUS THE BIOLOGIC*

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ORTHODONTISTS too often assume the attitude that a fair knowledge of the anatomy and function of the dental arch and its surrounding structures added to a few laws of mechanics is sufficient to qualify one to practice orthodontia. To accede to such a belief is comparable to accepting the fact that a diagnostician does not need a knowledge of surgery, an obstetrician no knowledge of anatomy, a dentist no need of physiology. As a practicing orthodontist he may be more interested in the abnormal and its treatment than a general practitioner would be, but to have a comprehensive knowledge of the abnormal he must have a thorough knowledge of the normal.

Orthodontists are no longer correctors of dental deformities by force, and unless they have a knowledge of dentistry, physiology, nutrition and metabolism, plus the knowledge of preservation and the functional adaptation of bone and surrounding structures they should not qualify.

"In recent years the tendency has been to abandon the mechanical theory of growth and to conceive adaptation to function to be all-important factor and conversely, that lack of function arrests growth. The effects of environment must not be overlooked, nor the fact that the development depends upon conditions under which it takes place."—(J. W. Jenkinson.)

The increasing conviction that an improper understanding of growth and development of tissues as a whole exists, overwhelms us. Why do certain tissues always develop along certain lines unless they meet with interference? Why is change, in the form and position of bone or of its function, ever followed by certain definite changes in its internal architecture, by equally definite secondary alterations of their external confirmation in accordance with mechanical laws? To answer this, one might as well answer the question, What is Life? We should require to have revealed to us the intercellular metabolism, the rôle of the endocrines, the part played by calcium, phosphorus, the proteins with their intricate amino acids, and all the varied factors that influence growth and development.

To consider maldevelopment of the dental arch one needs to understand those stimulating factors that first favor normal architecture of the whole organism. The rôle of heredity with its transmission of inherited characters and tendencies cannot here be considered. We mention only the intrauterine period of development of those traits received from the germ plasm, influenced by the nutritional metabolic process and other factors through the maternal circulation; we can only call to your attention the inherited growth tendencies presented to the fetus. Needless to say, the organism leaves its individual mark on each and every structure, some of which suffer more than others. We are today concerned with dental deformities.

* Read before the 1930 Congress of the European Orthodontological Society at Zurich.

Here, as elsewhere in the body, development takes place as the result of stimulation. The stimulus is the energy-producing factor, the impulse which causes motion, whether it be of a physical or chemical nature. The stimuli are no doubt of varied sources, the original perhaps being present in the so-called inherited growth tendencies further activated by other inherent environmental factors. They probably enhance the power of each other when acting in a coordinating way, and on the other hand, one stimulus may neutralize or overbalance the power of another. We are accustomed to thinking of stimuli as being central in origin, or arising from a source distant to the point where their maximal effect may be manifested. For instance, in deformities of the dental arch, we think of a central factor such as rickets, syphilis, malnutrition, etc., as being the chief cause, and disregard the fact that the deformed arch may be the result of local causes.

Stimulation is necessary both for formation and also for preservation and growth of bone, for instance, the removal of all strain vitally affects the skeletal system as well as the bones of the dental arch. Refraining from those foods requiring mastication causes lack of development in the arches, just as a failure to walk well causes a cessation of development in the bones of the lower limbs of the young. This stimulating effect is then necessary and may be looked upon as being of a mechanical origin, intermittent though it be and comparable to a stimulus produced by any equal amount of pressure from any outside origin.

Growth is defined by Davenport as follows: "Growth is a response to stimuli. Hitherto, we have regarded the process of growth in too mechanical a way, as certain nutritive compounds passing into a chemical mill to be inevitably transformed at a certain rate into protoplasm or formed substance. We have now to recognize that growth processes are essentially vital processes, and, as such, characterized by all that complexity which we find in such a vital process as response to stimuli."

Johnson defines function as follows: "The term function as it is generally used is limited to expression of the specific activity of an individual organ or part, as the digestive function of the stomach or the secretory function of a gland, but in the study of form development it takes on a more comprehensive meaning; it expresses all the dynamic processes of living organisms, the complex of chemical reactions, the action, reaction and interaction of organs and parts in adjustment of life."

Conklin says, "Stimuli are chiefly energy changes of physical or chemical nature. There is no activity without stimuli. Every activity of an organism is a response to one or more stimuli. The response to a stimulus may be modified or inherited in the following way: through conflicting stimuli and changed physiologic states due to fatigue and hunger, etc. Many stimuli may reach the organism at the same time and if they conflict they may nullify one another or the organism may respond to the strongest stimuli and disregard the weaker ones. When an organism has begun to respond to one stimulus it is not easily diverted to another."

The work of orthodontists is correction of facial deformities, which we endeavor to accomplish by causing malposed teeth to move into normal functional relationship. Orthodontic treatment by the use of mechanical appliances has

been used since before Fauchard for the purpose of correction of malocclusion, and since appliances will cause teeth to change their position, orthodontia has led to abuse in the use of appliances by pushing and pulling teeth around in the arch irrespective of how this is accomplished.

In producing tooth movement we must have harmony in function, and harmony in function is nature's method of retaining teeth. If we move a tooth through the stimulation of the orthodontic appliance faster than normal growth can take place, we are creating disharmony. Oppenheim, in his work, has shown that by heavy pressure there is produced a compression of the blood vessels in the peridental membrane. This is a manifestation of a positive disharmony. If the teeth are tipped in moving, it is a sign that growth is taking place faster than normal development, and we are establishing another disharmony in functional adaptation of the teeth and surrounding tissues. In other words, we are destroying nature's method of retention.

Growth, with all of its complexities, is the basic principle which causes a tooth to change its position. The appliance is only an aid in so far as it produces a stimulus; therefore, unless one has the proper concept of bone growth, and unless he thinks and believes and knows that it is a growth problem, an orthodontic appliance cannot be used intelligently. If one believes that the appliance is the director of the movement of the tooth, that the appliance is the thing that causes the tooth to move to its desired position and that it requires some kind of a device to hold it there in order to have it become fixed, his orthodontic efforts can only lead to failure.

When we place an orthodontic appliance on the teeth of a child and apply pressure to the teeth, the instant that pressure is conveyed to the tooth marks the dividing line where mechanics stop and physiology begins. From that time on any change that takes place in the position of the tooth must be the result of the change in the supporting tissues.

Pressure atrophy is very frequent, the atrophy caused by increased resorption both lacunar and smooth, occurs under the influence of continuous pressure even from a very soft and elastic substance. For example, increased intracranial pressure from cerebral tumors or abscesses may thin the skull or produce irregular furrows on its inner surface, the free calcium being removed partly by lymph into the dura. Tumors of the dura or hair, follicle tumors of the scalp, have been known to perforate the skull.

In the neighborhood of the pressure there is occasionally a reactive appositional new formation of bone preceded by sclerosis as an expression of mild inflammatory irritation, while the destructive process continues. In the experiments of Jores, the application of constant pressure led to disappearance of lacunar as well as smooth resorption, while new formation appeared on removal of the pressure.

According to Dr. Edward Kaufmann, professor of pathology of the University of Göttingen, the following processes occur during pathologic new bone formation. He says: "Pathological new bone formation occurs in exactly the same way as physiological new growth.

"The marrow, periosteum, cartilage, and with restrictions, the connective tissue, are bone-forming structures. The actual bone producers are the osteo-

blasts, and their points of origin are the periosteum and the endosteum of the marrow. The connective tissue and the cartilage are more limited in their importance, the latter is frequently replaced by bone, but usually only indirectly, after previous resorption and seldom directly. The endosteum consists of a fibrocellular structure, which clothes all the spaces of the bones, and produces at the same time the vascular and connective tissue framework, enclosing the specific bone marrow parenchyma in its meshes. The endosteum serves to produce the new bone of the skeleton as well as bone resorption.

"New bone is formed in various ways.

"(A) From the apposition of osteoblasts to completed bony trabeculæ. These cells come from the connective tissue of the inner layer of the periosteum as well as from the marrow, but more accurately they are a particular part of the marrow, the endosteum, which is genetically like the periosteum, and is in uninterrupted communication with the latter. The osteoblasts lie along the older trabeculæ somewhat like polymorphous epithelial cells with fine prolongations; they increase in number by nuclear divisions. After their nuclei disappear, they change into a homogeneous-appearing, but actually fibrillar, groundwork, which becomes lamellar bone after calcification; but some of the peripheral protoplasmic layers become ground substance, in which, then the center is enclosed as a bone cell in an angular cavity with prolongations. These cell cavities are called 'bone bodies.' In the above conditions the osteoblasts produce a more or less thick covering around the bone.

"(B) In another form of bony new growth, the osteoblasts gather together into a large focus, and produce masses and trabeculæ in the growing marrow or periosteal layers. The growth of all the cells of the endosteum and the periosteum is very vigorous and characterized by much nuclear division. Inside of the masses of large, nucleated osteoblasts, low magnification shows a homogeneous ground substance, which on stronger magnification is found to be finely fibrillar, glutin-containing and without calcium (osteoid tissue) to the formation of which some of the osteoblasts are assigned; in other parts, plump, rounded, and later angular cavities are enclosed, thus becoming bone cells; osteoid tissue is bone without calcium salts. The accretion of calcium salts changes osteoid tissue into completed bone."

(According to Schmorl, iron accumulates in the ground substance before calcification, and iron salts are a sort of whip for the subsequent accumulation of calcium, furthermore, following partial resorption, new bony substance may be applied in lamellae by osteoblasts.)

"(C) New bone is caused by direct change (metaplasia) of periosteal or endosteal connective tissue to bone, without cell growth. The striped ground substance becomes thickened, sclerosed and has a peculiar sheen. After taking up calcium granules, which later coalesce to a homogeneous mass, this osteoid tissue becomes bone.

"(D) The growing periosteum, more rarely, the marrow, i.e. the endosteum, may also produce cartilage. Between its formative cells, the chondroblasts, there appears a hyalin-chondrin-containing ground substance; later the cells lie in rounded spaces surrounded by thickenings, like capsules. There then appears a cartilaginous or chondroid tissue, which is changed into osteoid or into actual cartilage.

"(E) The cartilage is changed into bone by its ground substance absorbing calcium salts, then vessels and marrow cavities appear. The capsules of the cartilage break open, the free cells disappear, the vessels and cells of the marrow invade the spaces. From the marrow, therefore, when osteoblasts arrive, there is formed bony substance, which is laid down on the walls of the cavities, the calcified cartilaginous ground substance remaining in trabeculæ. At first, after almost complete disappearance of the cartilage, an osteoid tissue is produced by the invasive marrow, and laid on the remaining cartilaginous trabeculæ. Then the osteoid tissue may become calcified, and the marrow may produce more bony substance by the activity of osteoblasts.

"(F) By metaplasia, the cartilage is turned directly into bone. Cartilaginous bone is irregular, the bone bodies are arranged in groups, columns, or isolated in the ground substance. In rickets, in the ossification of enchondromas, and in the formation of callus, it does play a rôle.

"Bone is, therefore, one of the connective tissue structures, and like all tissues it is made up of cells and intercellular substances. The cells are vital tissue elements, while the intercellular substance gives to the tissue physical character. The cells control the vitality of the intercellular substance. The point to remember is that in order to bring about a change in the intercellular substance, stimulation of the cells is necessary. New tissue of the body responds more readily to adaptive changes than does bone. So long as it is alive it is being continually built and rebuilt, formed and reformed. In other words, it is being continually molded by the physical forces to which it is subjected. This change involves a continual transition between three types of osseous structure—the periosteal, the Haversian system and the cancellous."

The orthodontic appliance is used for the purpose of producing a stimulus by applying pressure to the teeth. The amount of pressure, the frequency of application and method of applying pressure are a part of mechanics with which we, as orthodontists, are concerned. It is well to remember that there is a complex functional process of growth going on in the tissues surrounding and supporting the tooth as the result of the stimuli, natural to the growth, taking place before we place the orthodontic appliance, therefore, the stimulus from the appliance may be in conflict with the already natural stimulus of growth going on in the tissues around the tooth and in the organism as a whole. The pressure of an appliance on a tooth is an unnatural and not a normal or physiologic stimulus. This stimulus is probably first received by the nervous system, then finds its way back to the circulation and to the cells. We know that any stimulation to the nervous system long continued will cause fatigue with its well known result—atrophy.

In applying pressure with an orthodontic appliance, if the pressure is continuous for a considerable length of time, and the teeth are held by the appliance so that their movement is dominated by it, it is reasonable to deduce from our knowledge of bone growth that the trabeculae of the bone around the teeth would so adjust themselves as best to resist the force from the appliance, which is causing the teeth to move buccally, labially, and lingually. Now when the teeth are released from the effect of the appliance, there would have to be a complete rearrangement of the bone trabeculae in receiving the impact of mastication as the

only stress they had to resist, which is in a different direction from the force of the appliance. Though mastication is going on at the time the appliance is moving the teeth, the stress of mastication is less frequent than the pressure of the appliance which continues for a long time and in a different direction. These forces, as Conklin says, may act as conflicting stimuli.

In speaking of the factors of growth and development, Conklin says, "Functional activity is response to stimuli which may be external or internal in origin. The entire process of development may be regarded as a series of such responses on the part of the organism, whether germ cell, embryo or adult. The nature of the response is determined by the nature and state of the organism and by the character of the stimulus."

With regard to the development of organs, whose functions meet interference, he says, "Organs long unused undergo regressive changes and may become atrophic; for example, muscles of a limb, which have been paralyzed or placed in a cast, shrivel; on the other hand, use increases the size and strength of any organ. Inactivity or atrophy of one part usually leads to imperfect nourishment in related parts; for example, the optic nerve atrophies when the eye is lost, and muscles atrophy when the nerves leading to them are destroyed or paralyzed. In general, the normal development of any part is dependent upon its proper nutrition and this is dependent upon the functional activity of this and other related parts."

With regard to changes taking place during the critical growth period of childhood, Tyler has this to say: "The human body is composed of many distinct systems and organs, all indissolubly united in one organism, where every part is at once a means and end to every other part. The health and life of the whole organism may be disturbed or destroyed by the weakness of any one of the numerous parts.

"The complexity of the human body is the explanation of the great length of childhood. Nature always hurries the development of the individual as much as she safely can. She takes a short cut wherever this is possible. It is neither wise nor safe, however, to attempt to hurry her still more, as something fundamental and essential will surely be crowded out.

"Growth is anything but uniform in different parts of the body at any one time. Growth in children usually falls to a minimum at the tenth year. The next period of acceleration covers the twelfth to the fourteenth year. The decline in the fifteenth year is sometimes abrupt, sometimes gradual."

Conklin tells us that tissue and function are so inseparably associated in the problem of human development that they are one and the same thing. Can any one, then, having the proper biologic conception of the fundamental adoption of tissue, doubt that tooth movement is our problem?

The science of orthodontia is comparatively new, yet the knowledge of the fundamental principles underlying growth and development of the human organisms is well recognized in the field of biology. Tyler has outlined the period of active growth and has also indicated the period when growth is at a low ebb. Since our problem is one of growth and development in which we are treating a deformity, which is either the result of delayed development or just some fundamental disturbance, is it not a rational conclusion that the time to undertake to restore teeth to their correct relationship is when growth is the most active?

A lesson that we should learn from this is that the most propitious time to undertake orthodontic treatment is when growth and development will be taking place in that particular location. When treatment occurs, the teeth should at all times have sufficient freedom from the influence of appliances that the changes taking place can be in accordance with the functional adaptation of each tooth, which cannot be the case if teeth have to move solely and entirely in such direction as the appliance sees fit to carry them.

There should be several periods during the treatment of the case when the mouth should be entirely free of appliances. The general concept of moving teeth from positions of malocclusion, and then having the patient wear some form of a retaining device to hold the teeth in position, is an acknowledgment of the fact that we have produced this change in tooth movement, that a disturbance in functional relationship has been established, and that it is necessary to hold these teeth in the new position until functional adaptation can reestablish itself. This may also be termed as an admittance of failure in that particular case.

OUR PRESENT KNOWLEDGE REGARDING THE ETIOLOGY OF MALOCCLUSIONS*

By N. N. Bery, D.E.D.P. (Paris), D.D.S. (Penn.)

FROM the pages of history, we learn that there is but one way in which man can hope to attain to true knowledge, and that is slowly, little by little, line upon line; furthermore, such knowledge can only be acquired by the aid of organized observation and careful reasoning. It is through scientific investigation alone that the traditions regarding the relative relations of the dental arches, occlusions and their perversions can give way to tested truths.

Much has been written since the publication of Dr. Angle's epoch-making classification of malocclusions. Innumerable debates have taken place on both sides of the Atlantic, and many societies have sprung up, but there still exist various individual theories concerning the etiologic factors underlying the conditions with which we deal. In orthodontia some real progress has been made, and much light has been thrown upon obscure questions during the past few years. It matters little if some of the determinants have not yet been discovered, nor if, owing to the limited experience of our observations, we have failed to cover all the problems.

The dental profession is deeply indebted to Dr. Angle, who many years ago presented his conception of ideal normal occlusion; a conception which was generally accepted, and utilized in the treatment of malocclusions. Recently, however, there has been a tendency to discard it as a basis of classification, owing to its incompleteness. Dr. Angle does not take into account all the minor defects; therefore it fails to be a classification of abnormalities of position and is simply one of occlusion. Again, he takes little or no account of the relationship of the arches to the face; he considers them only in relation to one another. The basis of his classification rests on the position of the maxillary first molar, which position must always be considered as being normal. But it is possible that this important tooth can be in malposition itself. Further, no reference is made to maxillary atrophy, an important malocclusion that has been widely discussed by Hawley, Campion, and Pont.

In this paper, I have endeavored to collect and tabulate all the external and internal factors that lead to malocclusions, and shall present them under three main headings: general, proximal, and local, each division having several subdivisions.

GENERAL CAUSES

I. Dystrophic Heredity (Family Malpositions)

An inherited malocclusion is one that is transmitted from the parent to the child and the individual germ cells carry such characteristics with them before the union of the male and female germ cells. Each individual germ cell possesses

* A paper read at the Zurich meeting of the European Orthodontological Society, 1930.

Chart 1

Etiology of Malocclusions

General Causes

I. *Dystrophic Heredity.*
(Pont's classification, Frey's classification.)

II. *Pathological Heredity.*
(Syphilis, Tuberculosis, Ethylism, etc.)

III. *Congenital.*

IV. *Endocrine Disturbances.*
(Thyroid, Parathyroid, Thymus, Pituitary, Adrenal, Pineal, etc.)

V. *Malnutrition and Malcalcification.*
(Theories of Howe, Mellanby and Lenox.)

VI. *Rickets and Toxi-infections.*
(Scarlet Fever, Chickenpox, Measles, Tuberculosis, etc.)

Proximal Causes

I. *Vicious Habits.*
(Sucking, Biting, Posture.)

II. *Mouth Breathing and Nasal Lesions.*
(Adenoids, Tonsils, etc.)

III. *Abnormal Frenum Labii.*

IV. *Lack of Muscular Balance.*

V. *Temporomandibular Articulation.*
(Pro- and Retroglissment, Cicatricial and Muscular Contractions, etc.)

VI. *Bony Lesions.*
(Harelip, Cleft Palate, Osteomyelitis, etc.)

VII. *Abnormal Tongue.*

Local Causes

I. *Dental.*

(a) Early loss of deciduous teeth.
(b) Tardy loss of deciduous teeth.
(c) Tardy eruption of permanent teeth.
(d) Early loss of permanent teeth.
(e) Abnormal sizes in teeth and jaws.
(f) Anomalies in number.
(g) Caries.

II. *Maxillary.*

(a) Evolution and hereditary effect on the apical base.
(b) Malformations of the maxilla (sagittal, transversal, vertical).
(c) Mandibular malpositions (articulation, temporomandibular).

a certain amount of chromatin that presides over inheritance. In order that a child may inherit malocclusion, the malocclusion must be impressed upon the chromatin of the germ cell. Dr. Kadner, of Hamburg, believes that the blood glands rule the growth of the body. If damage occurs to the sexual glands, which are responsible for the preparation of the new germs, this will influence the substance of the germ which contains the idioplasm, and an idioplasm influenced in this way is able to produce the same anomaly throughout many generations. Whatever may be the various theories regarding hereditary influence, it is on record that many families have inherited abnormalities of the jaws and malocclusions through several generations.

That mandibular prognathism, or "Maladie de Gallippe," was prevalent in the family of Hapsburg has been established by Professor Rubbrecht. With regard to this same family, Dr. Häcker, in 1911, proved that progenia was dominant with the male sex; and Dr. Aguilar, of Madrid, is of the opinion that it was transmitted more by the female sex, than by the male. Dr. Korkhaus, of Bonn, has recently been able to trace abnormalities in twins and families, through from four to six generations.

Dr. Pont, of Lyon, has drawn attention to conditions of mandibular retrognathism due to hereditary influences, and Case has described biprotrusion and bimaxillary atrophy brought by the same cause.

Differentiation must be made, however, between familial and acquired malocclusion. Mandibular prognathism has been known to be caused by a child copying a nurse who was affected with the same; the child projecting the chin forward in imitation, and acquiring the habit. Such a habit, however, can easily be broken once the nurse is removed.

Dr. Frey, of Paris, has divided teralogic heredity into five classes:

(*a*) Achondroplasia: characterized by shortening of condylar and basilar portion of occipital bone and the backward tendency of the nasal portion of the face, the mandible remaining normal; resulting in maxillary distoclusion.

(*b*) Cleidocranial dysostosis: characterized by the forward displacement of the upper portion of the face; resulting in maxillary malocclusion.

(*c*) Craniofacial dysostosis: caused by early synostosis of skull bones, and reduction of facial bones; resulting in false mandibular prognathism and maxillary distoclusion.

(d) Familial dysostosis: caused by osteopsathyrosis, leontiasis ossea, and oxycephaly; resulting in the abnormal development of the maxilla, and consequent malocclusions.

(*e*) Familial abnormalities: caused by hereditary transmissions, resulting in dental abnormalities of number, size, and location; congenital atrophy or hypertrophy of the maxilla. These are also supposed to be the result of intermarriage of races, or the mixing of types. For instance, a child will often inherit the large teeth of the father, and the small jaw of the mother, resulting in an overcrowding of teeth in the jaws.

II. Pathological Heredity

Under this heading come the effects of hereditary diseases transmitted to the child, among which the most important are heredosyphilis, tuberculosis, and

ethylism. We often notice in heredosyphilitic children deformations due to cleft palate, harelip, supernumerary and missing teeth, Hutchinson's teeth, erosions, etc. A child suffering from tuberculosis will erupt the deciduous and permanent teeth early. The roots of a deciduous tooth after eruption remain unabsorbed, therefore the permanent tooth often appears by its side. The chronic intoxications caused by these diseases have an unhealthy effect on bone growth and development, and usually the lymphatic glands, tonsils, etc., are infected thereby, causing malformations due to proximal causes.

III. Congenital Factors

Congenital malformations are the product of late and early intrauterine disease. Nearly all such malformations originate in the first six weeks of intrauterine life, or the embryonic period; and when the malformed embryo becomes a fetus, it carries whatever malformations it has into the fetal period, and is born with them. Dr. Wienberger, of New York, has given much attention to this subject, and contends that a great many abnormal conditions will undoubtedly be found to be the result of mechanical disturbances brought about by amnionic pressure during the development of the fetus in the course of its intrauterine life.

The study of mechanical malformation shows that the normal headbend of the fetus is accentuated by external forces or pressure, causing the floor of the mouth to approach the roof of the primitive buccopharyngeal cavity. This mechanical pressure can push both the nose and the hard palate backwards, changing the direction of the palate; its posterior position being tilted upward so that the angle which it forms with the basis cranii has been made greater than normal. The sagittal dimensions of the mouth cavity may be reduced, the abnormal pressure against the jaws acting in a backward manner. Thus we find that mechanical malformations effected by amnion pressure, cause the region of the dental arches to be wholly or partly compressed, and the hard palate to be displaced in the direction of the base of the skull.

In cases of breech presentation of a child, the infant is delivered from its mother's womb on its back, by pulling out the legs and arms one by one, and finally the head. It is often necessary to put the fingers into the baby's mouth, and exert force on the mandible. In such delicate operations, the pressure on the mandible unfortunately destroys the tooth germs, and I have known of a case of breech presentation, where the child never developed any mandibular right central or lateral incisors (the germs having been destroyed during the operation), resulting in a serious malocclusion at a later period.

If during pregnancy the mother is improperly fed and badly nourished, this will affect the development of the child to such an extent that it will be poorly developed. Children born of mothers who have been forced to do a large amount of physical labor during pregnancy, show physical imperfections in a great many respects.

Certain constitutional conditions that may be said to be congenital, are acquired from the mother during pregnancy, and play an important rôle in malocclusion, which may make its appearance only in later years. Cell metabolism, or faulty development, plays a much greater part than has been supposed. Owing

to imperfect germ cells, or germ cells that are abnormal, the child will develop and possess a physical organism which is not capable of withstanding the influences surrounding him; resulting in a lowered physical state, causing malocclusions.

Children who are the result of the union of unhealthy or weak germ cells, develop all kinds of physical ailments, and betray abnormal and retarded development, in which must be included maldevelopment of the teeth, and their supporting structures. Therefore, after the union of the male and female germ cells, allowing for the influence of inheritance, dystrophic and pathological heredity—congenital factors play a leading rôle in malocclusions, during the fertilization and the birth of the child.

IV. Endocrine Disturbances

Falta, in his "Ductless Glandular Diseases," shows that the endocrine organs have a direct bearing on the oral cavity and teeth. Mendel has stated that, "There is reason to believe that the growth of bone in the young is only one of the developmental processes under physiological dominance, in this case, of the endocrine or ductless glands." Systematic investigations have proved that endocrine secretions have a very definite influence upon the development and preservation of the teeth. Erdheims, experimenting on rats, has produced tetany by the extirpation of the parathyroid. Fleischmann believes that in children hypoplasia of the enamel is always due to tetany, and that deficient calcification of dentine is also due to the same cause. Fleischmann and Krang have observed changes in the teeth after extirpation of the hypophysis and parathyroids. The teeth of thyroidectomized pigs and guinea pigs, were found to be decidedly smaller than those of control animals. Dolkowsky found that there are more dental irregularities and decay in homosexual, than in normal men. Talbot noted, that in degenerates and idiots in Europe, there were very marked deformities of the jaw, and irregularities of the teeth; especially narrow and saddle-shaped arches. He called the deformities occurring with hysterical individuals "neurotic palate."

Teeth and bone structure depend a great deal as to normal shape, position and integrity, upon normal tissue. Therefore, altered metabolism, due to changed endocrine functioning during the developing period of childhood, will interfere materially with the normal development of these structures, giving rise to abnormal shapes of the jaws, abnormal bites, and various degrees of malocclusion, and also will produce a predisposition to caries. We find an irregular growth of the teeth, consisting of retardation of eruption, complete retention, aberration, torsion of axes, gemination hypertrophy, or hypotrophy in the mass, complete absence of single teeth, or whole groups of them, supernumerary teeth, and displacement of the germ. The jaws betray typical forms: prognathism of the mandible or maxilla, or both, degenerating in extreme cases to animal forms; maxillary and mandibular V-shaped, high palate ending in a sharp arch, narrowing of the maxilla, open and close bite. Taking the glands separately, let us now see what each contributes to these all-important factors.

(*a*) Thyroid: The thyroid gland is responsible for imbecility and infantilism. It is intimately concerned with the metabolism of the body, it stimulates oxida-

tion, participates in the control of growth, both physical and mental, and acts in intimate association with the other ductless glands; in combination with which it governs calcium metabolism, neutralizes poisons introduced into, or manufactured in, the body, and actually participates in the process of immunity.

The thyroid gland is essential in the development of the fetus, because it is normal for women during pregnancy to develop an enlargement of the thyroid gland, which subsides rapidly after the child is born. The prolonged call of pregnancy has sometimes the effect of unduly exhausting this gland, and therefore mothers are unable, in consequence, to suckle their children, as lactation is dependent upon a due supply of thyroid secretion. Such women become obese and lethargic, and remain so until the thyroid has time to recover itself.

Thyroid secretion is essential to the utilization of the calcium salts, and exerts an influence on the development and preservation of the teeth, by enhancing the calcium deposit. It has been proved by Professor Marfan, that the absence of this secretion tends to produce malformations of the jaws, due to defective bone growth.

Adenoids and enlarged tonsils occur in children who have an insufficient supply of thyroid secretion, and we shall see later how this contributes towards malocclusion. The dental features of a hypothyroid case show delayed dentition in early stages and a dirty mouth full of caries, while the hyperthyroid has a clean mouth and good teeth. The thyroid individual is irritable, has teeth which are thin, transparent, graceful, and of a bluish grey-white color. The hypothyroid type is lazy, obese, constipated, easily fatigued and of poor mentality. He has bad appetite, and suffers from frontal and occipital headache, and various arthritic and muscular pains. The deciduous teeth are retained for a long time.

The hyperthyroid type usually shows abnormality respecting puberty; and often suffers from exophthalmic goiter; he is tall, thin, highly strung and mentally active. Dermatoses, urticaria, neuritis and migraine are frequent—giving evidence of increased metabolism and sympathetic irritation; he also blushes and perspires freely. The athyroidea, or cretin, if left untreated, stops growing physically and mentally.

(*b*) Parathyroids: These maintain and regulate calcium metabolism, while they destroy toxic substances which have a preference for the nervous system. Extirpation of the parathyroid causes tetany and finally death, associated with a serious loss of calcium; while impaired functioning leads to osteomalacia and soft teeth.

(*c*) Thymus gland: This gland exerts a profound influence from birth to puberty. It controls mineral metabolism, especially that of calcium. It regulates phosphorous metabolism, controls bone growth, stimulates blood-forming organs and lymphatic glands, and regulates the growth and activities of the sexual organs during childhood. The juvenile thymotrope has the teeth of a baby, they resemble bluish porcelain, and are thin and translucent at the grinding edge, where they show a tendency to scallop. The gland acts as a calcium absorber, and is therefore antagonistic to the reproductive organs (calcium excretors). If the function of the thymus gland is impaired, enamel defects begin to show, growth is retarded, and faulty mineral metabolism ensues leading to rickets.

(*d*) Pituitary gland: It is this gland which controls growth, stimulates the cardiovascular system, and the involuntary muscles of the intestines and uterus. The pituitary gland consists of three distinct portions: anterior and posterior lobe, and pars intermedia. The anterior lobe presides over the bone production of the long bones and the face, and its continued activity leads to persons assuming giantlike proportions. Hyperactivity in the adult causes acromegaly, with its characteristic big hands and feet, protruding maxilla, large head and a prominent forehead. It further tends to produce overdevelopment of the mandible causing macromandibular development and malocclusions, the so-called mesioclusion of Class III. The anterior lobe favors calcium retention and absorption, and disease; brings about adiposity, asexualism, and reduced bodily activities, including subnormal temperature and marked asthenia.

The posterior lobe yields pituitrin, and favors carbohydrate metabolism. Pituitary people are gentle and kind, and when pituitrin predominates in the male at the expense of the adrenals, the result is effeminacy. Hypopituitary is manifested by stunted growth of the long bones, long tapering fingers as in a woman, the pelvic girdle is broad, and there is distribution of hair in the adult over the pubis, the voice does not assume the deep male tone—and in many other ways there is a resemblance to the female type. Abnormal functioning will lead to a high, crowed arch, or to a widespread arch and an irregular arrangement of teeth, and especially to large square maxillary incisors.

(*e*) Adrenal glands: These maintain the tonicity of the involuntary muscles, particularly of the heart and blood vessels, influencing the blood pressure and circulation. The cortical portion of the gland is concerned in the development and control of the ovaries and testicles, while the medulla portion gives adrenalin, which has a powerful effect on the sympathetic nervous system, stimulating the heart and raising the blood pressure. The adrenal glands stimulate the saliva throughout the sympathetic system, making it more alkaline and rich in mucin and minerals that favor the preservation of the teeth. The hypoadrenal type of malnutrition is evident in the pale, emaciated, asthenic child, who tires easily, always feels chilly, and has brown moles and discolorations of the skin, a capricious appetite, poor mentality, low blood pressure, and is subject to attacks of nephritis. The hyperadrenal child is usually tall, dark, thin, with long silky hair, delicate and active. Dr. Lintz says that the adrenal-predominating individual has strength, endurance, and progressiveness, and is by nature a fighter. Women with an adrenal predominance, have red hair, are very virile, restless, and vaunting; always desiring to rule others, and acquire masculine traits. In addition to the above we shall add that the possession of long sharp canines is indicative of adrenal.

(*f*) Pineal glands: These glands are supposed to act in conjunction with the thyroid glands in enhancing the calcium deposition, thereby preserving the teeth. They hasten maturity, physical, mental and sexual; this has been made evident through the adverse effect brought about by tumors on this gland.

(*g*) Ovaries: "That a woman is a woman because of her ovaries," has been well said. They have a profound influence on the sexual development and life of women, and produce ova for fecundation. The ovaries are responsible for the soft voice, the absence of hair, the body contour, and facial characteristics. They

control menstruation, and maintain pregnancy in the early months, regulate oxidation, and are intimately concerned with the calcium metabolism of bone. Castration of the female early in life, tends to produce masculine traits. Tandler and Gross have described women who have undergone castration as possessing small heads, long, disproportionate limbs, and a lack of hair on the face and pubic region.

The action of the internal secretion of the ovary is to inhibit bone development; this secretion is diminished during pregnancy in the early months. Disturbed menstruation is frequently reflected in the oral cavity. Infantilism, with scanty menstruation, due to ovarian hypofunction, is frequently associated with various types of dental abnormalities, such as diastema, retention of deciduous teeth, etc. In persistent menorrhagia of endocrine origin, caries develops as a result of faulty calcium metabolism. Severe toothache, neuralgia, stomatitis, and salivation, are often embarrassing indications of the menstrual period. When the ovaries cease to function, the menopause ensues, irrespective of the age of the woman. The redeeming feature of menopause is that it influences the dental apparatus favorably, progressive caries ceasing completely with the termination of the menstrual periods.

(*h*) Testicles: Testicles are to the male what ovaries are to the female. They regulate and control the male sexual form and life, produce spermatozoa, control nutrition, oxidation and cell activities generally. Diminution or removal of the testicles causes femininity, as is evinced in eunuchs.

(*i*) Islands of Langerhans: These are situated in the pancreas, and regulate the carbohydrate metabolism in virtue of their active principle, namely, insulin. When this is lacking, diabetes supervenes, causing diseases in the oral cavity.

In conclusion I must emphasize the fact that ductless gland secretions play an important rôle in the development and preservation of children's teeth. Dr. Hellman has stated, that owing to this factor, "The children of the wealthy are accelerated in growth, but retarded in dentition; while those of the poor, although exceedingly retarded in growth, are stimulated as regards dentition." Statistics concerning occlusion show—in the case of the children of the rich—only 17 per cent normal; while the figures for the poor give nearly 60 per cent.

V. Malnutrition and Malcalcification

Sir Arthur Keith states that vaulted and narrow arches and adenoid vegetations seem to him to be due to faulty nutrition. Professor Brash, as a result of his studies on bone deformities, arrives at the same conclusion We are greatly indebted to Dr. Percy Howe for his efforts in the field of animal experimentation, and we must acknowledge the weight of the evidence presented by his experiments, as well as that of the definite results obtained in the scientific feeding of livestock. Among the food factors which are often lacking in infant's food, or which may be destroyed during its preparation, is antiscorbutic vitamin, which specifically affects calcified structures. Deprivation of this factor causes bone and denture formation to cease. Dr. Howe maintains that deficiency of vitamin C is the prima facie cause of dental caries and periodontoclasia. Mrs. Mellanby, however, maintains that lack of vitamin D, antirachitic or calcifying, with the

absence of calcium phosphorus and sunlight (or ultraviolet rays) causes malcalcification of the bony tissues, and brings about malformations. Malcalcification has also been brought about by abnormal endocrine function. Dr. Lennox has more recently propounded the theory that dental disease is mainly a phosphorus deficiency disease, and that the elusive vitamins are only of academic interest. In his opinion, it is owing to an insufficiency of phosphorus in the diet that the formation and growth of the bony structures of the face are retarded, resulting in abnormalities, and as a consequence, nasal troubles, malocclusion, impacted teeth, etc.

Proper food is necessary to proper nutrition. Proper nutrition is necessary to the normal growth and development of all tissues, including the skeletal structure.

The children of the well-to-do are more likely to suffer from the effects of improper feeding than are those of the poor; because they are liable to eat foods in which there is a large amount of starch and sugar, also meat, and many other things which contain very little calcified tissue-builders. As a result the osseous structures of the individual will not be properly developed, because the eating of unsuitable foods does not require the proper usage of the jaws. Any organ to be developed must be used; and if the teeth are not given their proper work to do, and therefore no pressure is brought to bear upon them, then, no pressure is transmitted to the alveolar process, and the structure supporting the teeth. As a result of disuse there is lack of muscular development and of stimulating influences produced by muscular inactivity, and the entire face and jaws of the child do not develop normally, because of this lack of function and faulty cell metabolism. The skulls of ancient and primitive people show splendid dentures and massive jaws, that excite our envy and admiration, and we may entertain a hazy notion that somehow advancing civilization was responsible for our own sad deficiencies in these respects. The orthodontist has a splendid opportunity of benefiting posterity, by imparting to his patients a knowledge of proper foods and nutrition, regarding which great assistance can be derived from the study of Dr. Henry Hoffman's Food Charts.

VI. Rickets and Toxi-Infections

Rickets is a disease characterized by faulty bone formation. The excellent works of Professor Marfan and the experiments of Prof. G. Mouriquand, of Lyons, have drawn our attention to this important cause of bony malformations. Some investigators believe rickets to be due to a disturbance in the ratio between calcium and phosphorus; others to the antirachitic vitamin. The cause and the cure of rickets are still obscure, but cod liver oil, sunlight, and ultraviolet ray treatment are known to arrest the disease to a limited extent. As a result of faulty bone formation, the teeth are supported on a malcalcified alveolar process, and assume positions of malocclusion due to the stress of mastication. The muscles of mastication exert force on the bone and this causes deformity. The pull of the muscles straightens out the angle of the mandible, which becomes elongated and deformed. Rickets appears in childhood, and also in middle age, and sometimes during pregnancy. In children, the deciduous teeth erupt late and are lost early, giving rise to malocclusions. The teeth move in their sockets, and the

roots are quickly resorbed. The permanent teeth erupt late, taking extreme positions of malocclusion. The maxillary arch is narrow and contracted, and there is a tendency to form thick ridges in the palate near the molar region, while the mandibular arch is wide in the molar regions, with the teeth inclined lingually. Rickets is a disease that affects the two extremes of society, the rich and the poor; the former owing to improper food and the latter because of poor surroundings. Patients afflicted with rickets are mouth breathers, and suffer from enlarged tonsils and adenoids. Professor Mouriquand has drawn attention to malocclusions resulting from the diseases beriberi, pellagra, and scurvy, due to lack of vitamins. Scarlet fever, measles, chickenpox, syphilis, tuberculosis, and similar disorders are known to exert a deleterious effect upon the epithelial structures—producing atrophy of the enamel organ, destroying thereby the proximal contact or inclined plane, and sometimes destroying the tooth germ completely and producing malocclusion due to missing teeth. We shall now consider proximal causes.

PROXIMAL CAUSES

I. Vicious Habits

A habit is defined as "a fixed or constant practice, established by frequent repetition." The phenomenon of habit is a normal manifestation of living tissue, due to the plasticity of the organic materials of which the body is composed, and is essential to the development and functional activities of the organism. Normal habits help to maintain normal structural form, while abnormal habit movements are associated with abnormal structural form. A pernicious habit is an expression of a natural phenomenon gone wrong. Regarding the nature of those specific pernicious habits which are of interest in malocclusion, we possess a considerable amount of literature. The outstanding feature of most of them is that they arise from the instinctive life of the infant. Pullen states that simple and complex cases of malocclusion may be traced to abnormal habits of a neuromuscular nature, and inasmuch as they are intimately concerned with the muscles of the face, the oral cavity, and the lips, cheeks and tongue, they have the effect of changing the normal dental arches into abnormal ones, causing malpositions of the individual teeth, and facial deformities.

In reviewing these habits I shall divide them into three classes: sucking habits—biting habits—posture habits.

(1) *Sucking Habits.*—Dearborn has said, that whatever may be the cause of the habits of sucking and biting, they are almost as innate an impulse in humans as in brutes, and are continued from infancy onwards, becoming a kinesthetic satisfaction. Freud contends that the sucking habit is one of nature's means of bridging the sexual instinct from one generation to another. Nothwithstanding the originality of his suggestion one cannot but appreciate his viewpoint, that every child is born with instincts which furnish desires and cravings of a primitive nature, and which can be molded into energies of value under the influence of a healthful environment. Habit movements in children are, to an unknown extent, expressive of the conditions of nervous equilibrium in their growing organisms.

(*a*) Nipple Sucking: Nipple sucking is often initiated by the use of pacifiers by the mother, nurse, or physician, or—when the mother is unable to suckle

the child—by means of artificial bottles. It is assumed that the sucking habit is pleasurable to the child, and eventually becomes as indispensable as smoking is to some adults. In this habit we have to take into consideration the muscular action of the tongue, cheeks, lips, and the atmospheric pressure acting on cheeks, lips, and floor of nasal fossa. Suckling at the mother's breast not only requires strength in order to draw up the milk, but owing to the shape of the nipple, which is very short, it also calls for a powerful lip action, as the lips have to be firmly pressed against the breast so as to exclude the air. The muscles of the lips, and in particular of the orbicularis oris, are called upon to do that kind of exercise which will strengthen them, and will enable them later on to fight against teeth projection. But in sucking artificial nipples, the child sucks entirely with its tongue, and exerts with it a certain amount of strength, which tends to push up the palate—thus decreasing the size of the nasal fossa. In suckling from the mother's breast, the arch of the palate gets drawn towards the mouth. The distance between it and the frontal bone becomes increased, and the septum stretched, but in sucking artificial nipples, the arch of the palate is pushed up, the palatofrontal is decreased, and the septum acquires the shape of an S, decreasing thereby the aperture of the nasal fossa. This action is carried out mainly by the tongue, and brings about no muscular effort on the part of the child; the lips are not exercised, and become more or less atrophied. An undeveloped nasal fossa is favorable to the development of adenoids and to its infection, due to lack of aeration. It leads to mouth breathing, which encourages hypertrophy of the adenoids, and infections such as sore throat, bronchitis, etc. Added to which, artificial suckling provokes a pointed palate, projecting incisors and atrophy of the nasal fossa, and encourages the development of adenoids. Dr. Dreyfus, of Lausanne, who has studied this factor in detail, has fortunately placed a special feeding bottle on the market, the nipple of which resembles very closely the natural female nipple.

(*b*) Thumb, Finger and Object Sucking: Thumb sucking acts upon the plastic tissues of the face and oral cavity, in a similar manner to artificial nipple sucking. The effect of intermittent pressure continued for long intervals, may be seen in the typical protrusion of the maxillary labial teeth. The maxillary arch may be uniformly protruded, or acquire a deviation to the right or left, according as the thumb or object has been placed in the median line, or on the left or right side. If in the sucking habit a pressure be exerted against the maxillary teeth, this may lead to an open-bite malocclusion. In some cases several fingers may be employed causing an extensive malocclusion, as well as deforming the shape of the hand. If the fingers are hooked over the mandibular incisors, they are dragged forward, while the maxillary incisors are pushed up, producing an open-bite.

(2) *Biting Habits.*—Although varying somewhat from the sucking movement, the habit of biting the lips, cheek, or tongue, is just as persistent; and is likewise instinctive with young mammals.

Biting the lower lip between the maxillary and mandibular incisors, causes the maxillary incisors to protrude, and at the same time retards the development of the mandibular dental labial arch. This is an unconscious habit in which children indulge, leaving a semicircular red ring below the lower lip, as telltale

evidence. Biting the lip on one side causes a malocclusion of lesser degree, as does also biting the cheek. Biting objects will cause more or less protrusion of the maxillary incisors, depending upon the size of the object, accompanied by a depression of the anterior teeth. Biting the tongue has the effect of depressing the maxillary and mandibular incisors and canines, preventing them from developing vertically and giving rise to an open-bite.

(3) *Posture Habits.*—Posture or pillowing habits during infancy have a most deleterious effect upon the dental arch. Dr. Harvey Stallard, who has made an exhaustive study of the pillowing habits of children, contends that some malocclusions have their origin from the improper manner in which the mother allows the infant to sleep. Stallard claims that the weight of the head resting on the pillow, arm, or fists, will exert sufficient pressure to alter the shape of the bones of the skull. The prevalent practice in modern times, of mothers placing the infant on the stomach to soothe the restless child, causes pressure to be exerted upon the anterior maxilla giving rise to various forms of malocclusion. Stallard also maintains that cross bites, Gothic arches, unilateral and bilateral lingual occlusions of the maxillary arch, are caused by posture habits. It has been found that harmful sleeping habits are less likely to be formed when no pillow is used.

II. Mouth Breathing and Nasal Lesions

Mouth breathing has long been known as a proximal cause of malocclusion, since it disturbs the muscular and atmospheric pressure, and acts directly upon the surrounding structure. The majority of cases of mouth breathing are caused by hypertrophy of the pharyngeal tonsil. The cause of persistent mouth breathing is not always confined to the obvious one of nasal obstruction, or to adenoids. Deformity of the nasal septum produces a partial and sometimes intermittent obstruction, according to the condition of the mucosa of the inferior turbinated bones. Again, there are some cases of mouth breathing in which there is a short upper lip and an open-bite, and in which there is no nasal obstruction; but the mouth remains open and can only be kept closed by a distinct effort on the part of the patient.

An infant who is allowed to lie and sleep on its back, develops the habit of mouth breathing because, when relaxed, the mandible tends to drop by its own weight. The habit persists until a mature age; for instance, we see the imbecile with his open mouth, but strange to say, well-developed jaws and broad, free nose. Patients suffering from continued mouth breathing due to prolonged nasal obstruction generally acquire a vacant stare, the upper lip is short, there is a thin, narrow, poorly developed nose, sucking of the ala nasi, want of tone and clearness of speech, susceptibility to catarrhal and middle-ear deafness, congestion of the fauces and pharynx, sore throat, laryngitis, round shoulders, flat, shallow chest, deformed jaws and bad teeth.

In mouth breathing the tongue does not exert any force on the maxillary teeth, this allows the maxillary arch to remain undeveloped, resulting in a high palate and maxillary protrusion known as the Gothic arch. Diminution of the supply of air inhaled through the nasal passages will cause the mandible to drop, while the muscles that depress it hinder its forward movement; but when

the mouth is held open the maxillary and mandibular molars become sufficiently separated to allow the mandibular teeth to assume a distal relation to the maxillary teeth. This type of abnormality becomes definite about the age of six. Want of proper development can, however, be recognized at an earlier age from the lack of spacing of the deciduous teeth (which leaves little room for the eruption of the permanent teeth) and the absence of normal overlap. As the action of the muscles is abnormal, the upper lip does not exert pressure on the maxillary anterior teeth, thus allowing them to protrude. The lower lip drops back against the mandibular teeth, exerting pressure lingually, and the maxillary teeth cause the lower lip to become thicker by irritation, which in turn causes the maxillary teeth to protrude farther. Dr. Rogers has suggested certain stimulating and corrective treatments along the lines of Kinesi therapy, such as exercises to promote nasal breathing and expansion of the chest; these will tend to restore harmony in action, and balanced musculature.

In the case of an inflamed tonsil, the child protrudes the mandible to relieve the pressure and pain, resulting in a protruding jaw, with teeth locked in abnormal position. When the muscular action that moved the mandible forward is relinquished, the jaw drops back to its normal position, but as the teeth are locked in an abnormal relation, they so remain, and malocclusion results.

III. Abnormal Development and Attachment of Frenum Labii

The frenum may be abnormal in the upper or lower lip, but in the majority of cases the abnormality is in the upper. Associated with abnormal frena may be a thickened and abnormal lip, producing a bad facial deformity and malocclusion. The frenum is large and attached close to the gingival border at birth, but as the teeth erupt the connection takes place at a point more remote, because the teeth and alveolar process grow away from it. If the condition persists, we have a wide separation between the central incisors, resulting in malocclusion. In some cases the frenum is too short, and the patient is not able to raise the lip in order to give the proper facial expression to a smile.

IV. Lack of Muscular Balance

As we have already seen, unbalanced muscular tonus can be caused by mouth breathing. The habitual abnormal use of certain groups of muscles controlling the jaws, especially the pterygoids, becomes second nature to mouth breathers, so that even after the removal of adenoids and other obstructions to normal respiration through the nose, the disfiguring appearance of the mouth due to the continued action of these abnormal muscular habits, still persists; and it requires special muscle training in order to obtain satisfactory control. Sometimes one group of muscles becomes too powerful, and causes a maxillary deformation owing to lack of resistance on the part of the weaker group. Muscular disequilibrium can also be caused by tongue amputation, and painful teeth.

V. Temporomandibular Articulation

Dr. Frey, of Paris, has thrown much light on malformations of the jaw due to faulty temporomandibular articulation. Some of these deviations may be congenital, but such are rare. Others are acquired, and may be due to mus-

cular articulation or cicatricial contraction, or they may be of dental origin. Simple displacements may be caused by a child sleeping on a high pillow, resulting in a proglissment of the mandible with the mandibular incisors in front of the maxillary incisors, bringing about an inferior mesial malocclusion, by the sliding forward of the condyle. A retroglissment of the mandible caused by sucking the thumb and bringing about a sliding back of the condyle, will result in distal malocclusion. Hypertrophied tonsils, cicatricial contraction due to burns, scars, muscular contractures, or paralysis, cause false prognathism and posterior sliding of the condyle. The absence of the maxillary incisors may cause mandibular proglissment, and linguiversion of the maxillary incisors may cause retroglissment of the jaw.

VI. Bony Lesions

Harelip and cleft palate deformities are the cause of many ugly malocclusions. Harelip and cleft palate are simply improper unions of the premaxilla with the maxillary bud, and are often classed as congenital defects; some disturbance that occurred during intrauterine life, having produced a failure of union of these parts. The disunion, which may be partial or complete, has in either case its effect upon the malocclusion. Cleft palate can also be caused by diseases such as tabes, syphilis, leucoplakia, etc. Gun wounds, osteomyelitis, and cicatricial retraction have been known to cause atrophy of the mandible, resulting in mandibular retrognathism and vertical and transversal malformations. Alveolar hypertrophy, resulting after the extraction of opposing teeth in mandibular posteroclusion, is known to cause supraclusion or close-bite. Alveolar atrophy is caused in rare cases by sclerosis of the tissue, due to chronic abscesses of the deciduous teeth, preventing the eruption of the permanent teeth, and resulting in supraclusion, or open-bite.

VII. Abnormal Size of Tongue

An oversized or large tongue has been known to cause protruding maxillary and mandibular incisors, with a buccal version of the teeth. The teeth are pushed out of their normal positions, and large spaces occur between the anterior teeth, causing malocclusion. An undersized tongue occurs very rarely, so that little is known as to its influence on malocclusion.

We shall next consider local causes; these I shall divide into two main subdivisions, dental and maxillary.

LOCAL CAUSES

I. Dental Causes

We have perhaps all observed that deciduous teeth are factors of development, not merely locally, but constitutionally, as a result of mechanical stimulation through mastication. If the harmony of the deciduous arch is broken, and the masticating apparatus destroyed, the resulting effect is constitutional, because of insufficient mastication resulting from the loss of these teeth. With their loss, not only are the dental arches undeveloped, but we find a lack of weight in the child. Deciduous teeth are known to provide means for the proper mastication of food, they help to develop and widen the dental arches by stimulus through mastication, to allow nature to erupt and develop the permanent teeth

at regular intervals, and to establish the correct occlusal relationship of the permanent teeth, and the harmonious shape of the face. Let us now study malocclusions arising from:

(*a*) *Early loss of deciduous teeth.*—This may be due to constitutional causes when associated with rickets, etc., or to local causes when associated with decay, or early extractions. In either case malocclusion is bound to occur. The loss of the deciduous incisors allows contraction of space to take place in front, and produces abnormalities of permanent teeth later. Premature loss of a deciduous lateral incisor will permit the central to drift in front of the canine and close the space, and this will result in an impacted permanent lateral. The early loss of a maxillary and a mandibular deciduous canine, will permit the incisor to drift toward the side from which the tooth is missing, consequently the dental arch becomes too small to accommodate the permanent canine. Premature loss of deciduous molars, causes shortening of the jaw. The permanent molar drifts forward, resulting in an abnormal mesiodistal relation of this tooth, and impaction of the premolar. The loss of the first deciduous molar may also allow the deciduous canine to move slightly backward, and the second deciduous molar to move forward, thus causing the first permanent molar to erupt in malposition. Proximal fillings in deciduous teeth should restore the normal contour, and thus preserve the mesiodistal width of the teeth and arch as a whole.

(*b*) *Tardy loss of deciduous teeth.*—Prolonged retention of deciduous teeth is mainly due to nonresorption of roots, and has a pronounced tendency to cause malocclusion, by not allowing the permanent teeth to assume their normal positions, and occlusal relations.

(*c*) *Tardy eruption of the permanent teeth.*—This may be due to a constitutional disease, or the result of a poor physical development, that prevents proper calcification and eruption, or to the nonresorption of the roots of the deciduous teeth. If the deciduous teeth have already been lost, then the space remaining vacant, due to the noneruption of the permanent teeth, will be closed by others coming nearer together, because of the loss of the proximal contact.

(*d*) *Early loss of permanent teeth.*—When this occurs it produces a malocclusion which is very difficult to treat. It destroys the masticatory apparatus of the patient, and is therefore a predisposing factor of pyorrhea. Between the fifth and sixth years the first permanent molar starts to erupt distal to the deciduous molar, and unless the deciduous teeth are all in position, or the space is maintained if they are lost, the permanent molars may tend to drift forward. That is why when Angle advanced his theory that the uniform position of the maxillary first molars could be considered as a reliable key to occlusion, it was vehemently attacked. In the second German edition of his textbook, Grünberg admits that the maxillary first molar may undergo a mesial displacement as a result of the premature loss of deciduous teeth, when malocclusion is sure to result, irrespective of the age at which the first permanent molar is lost. Loss of the mandibular first molar permits the mandibular second molars to tip forward half the space width, and the teeth in front of the other half, backward, destroying the occlusion of that side of the mouth by causing a deviation of the center; the incisors swing round to one side, and may overlap the maxillary anterior teeth, causing the chin to approach the nose, resulting in a facial de-

formity. The loss of the first permanent molars before the eruption of the premolars, causes the child, for a certain length of time, to bite on the incisors. The bite closes, the maxillary teeth are pushed forward, and the mandibular teeth backward. The position of the third molars is adversely affected by the loss of the permanent incisors and premolars. According to Lundström, the premature extraction of the first permanent molars can cause the formation of extensive spaces in the anterior part of the jaw, or may arrest the development of the apical base.

(*e*) *Oversized teeth in undersized jaw, or vice versa.*—Large teeth in a small jaw lead to overcrowding. The most usual result is the rotation of the maxillary incisors, the distal surfaces approaching each other posteriorly or anteriorly, or there is overlapping of the central incisors by the laterals. The absence of spacing in both jaws in the deciduous denture, is invariably accompanied by a bimaxillary crowding in the permanent denture, and which is recognizable by the apical curve being abnormally small, in comparison with what it would be under normal circumstances.

(*f*) *Anomalies in number.*—We often find cases where there are either supernumerary or missing teeth. The former condition is due to supplementary tooth germs present before birth; the latter, to lack of tooth germs (usually premolars and lateral incisors). This condition has often been traced through families and is believed by some authors, such as Dewey, to be a congenital hereditary cause of malocclusion.

(*g*) *Caries.*—The loss of mesiodistal diameter of teeth, due to improper restorations, faulty contours, and imperfect points of contact, brought about during the treatment of caries, often results in malocclusions. A tooth should be restored to its original shape, size, and contour, in a hard substance of a permanent nature such as gold or amalgam. If the occlusal surfaces of the teeth are not properly restored, we may destroy the forces of the inclined plane. A tooth in which caries has progressed, to the point where it becomes painful to chew on, will naturally be avoided, and the process of mastication shifted to the opposite side of the mouth, with the formation of abnormal muscular and masticatory habits. This disequilibrium of muscular forces tends to form indifferent habits of chewing, which may extend on through life. The child, if thus affected, begins to masticate in such a manner as to miss that tooth, permitting some of the teeth to lock abnormally when they are erupting, by throwing the mandible on one side, and thereby furnishing the starting points of a severe malocclusion.

II. Maxillary Causes

During the last two decades, orthodontic practice has been governed by the belief that the movement of the teeth is capable of so affecting the surrounding regions that the latter adapt themselves to the new position of the teeth. But Dr. Lundström, of Stockholm, and Dr. Nevereze, of Paris, have proved from actual cases that this is not true. The results of their orthodontic experiments show that a normal occlusion attained by mechanical treatment, is not necessarily accompanied by a development of the apical base in harmony with the positions of the teeth, and it therefore follows that an occlusion attained, cannot always be maintained. The prognosis for the successful treatment of a case of malocclu-

sion, therefore, depends upon the state of the apical base, since, in an ontogenetic sense, the occlusion is not able to control the apical base; while on the other hand, the latter is in a high degree capable of affecting the occlusion. It is therefore necessary, instead of regarding anomalies of the positions of the teeth from a therapeutic point of view, as simply, or principally, occlusal problems, henceforth to regard them as being, in an equal degree, problems of the apical base.

Malocclusions belonging apparently to the class of apical base disturbances, have been artificially produced by Dr. Mellanby in dogs, and also by Dr. Howe in monkeys. A superficial interpretation of paleontologic evidence, as to the phylogenetic development of the denture, has contributed toward establishing the idea that crowded dentures are in some way connected with the general decline of masticatory power in man. The diminished use of an organ can lead to its becoming atrophied, and that this atrophy becomes hereditary has been taken to account for the existence of malocclusions. Like other weakly functioning organs, then, the jaws will show reduction in size, and the crowded dentures are regarded as a first manifestation of the same. Wirchow has compared the dental apparatus of present-day civilized man with that of the prehistoric races, and has found evidence of a reduction of the entire arch, and of a diminishing degree of prognathism. Dr. Pfaff, of Leipzig, explains that the contracted dentures are due to the jaws and teeth not diminishing in size to the same relative extent, and to the atrophy of the jaws proceeding further than that of the teeth.

It is known that there are a number of types of mammals in which it is considered an established fact that their masticatory apparatus shows signs of a retrogression, such are the Pteropus, Bradypus, and Proteles.

If the human race is, in reality, passing into a stage characterized by less effective masticatory apparatus, owing to the diminished use of teeth, then it is to be expected that this change will be brought about through an harmonious reduction of the jaws and teeth, taking place simultaneously, and that it will be largely through the normal individual that development will proceed, so long as abnormalities are not protected by artificial selection. A number of prehistoric and modern savage races, are characterized by very effective dental apparatus, in a prognathic position and with more space provided for those teeth situated farthest back, and which appears to be more effective than that found with orthognathic races. The mandible of Homo heidelbergensis is thought to have belonged to an individual having far more powerful masticatory organs than those found among the cultured races of the present day.

Assuming that in the modern orthognathic types, the third molar of the mandible is more liable to cause disturbances during eruption, and is more often of a retrograde type, or even entirely wanting, than is commonly the case with more prognathic types, and further assuming that in man the denture is in process of a retrograde development, due to arrested development in the length of the mandible, caused by a less intensive use of the teeth, we should expect that in those cases where such a considerable divergence from the normal exists, such as inadequate space for the third molar, this lack of efficient use of the teeth would involve deficiencies in the development of the apical base. It is a well known fact that even in the most ideally formed jaws, the space for the third molar can be so inadequate that its eruption may be accompanied by serious

complications. The retrograde development of the denture in man, due to lack of use, finds expression in the reduction or disappearance of the third molar. The arrested development of the apical base in man has been known to be the cause of severe malocclusions; but in view of the extreme slowness with which phylogenetic alterations take place, it must be considered out of the question that malocclusions of the teeth should be regarded as a step towards a nonpathologically proceeding transformation of man's dental apparatus. Malocclusions in regard to therapy should not be looked upon merely as problems of occlusion, but also as problems of the apical base.

Maxillary malformations may be in the sagittal, transverse, or vertical sense. Many of the etiologic factors already discussed may bring about these maxillary deformations. Prognathism, retrognathism, bimaxillary protrusion and retrusion, can be due to the over- or underdevelopment of one or both jaws. Distoclusion is known to be produced by the arrested development of the mandible caused by extraction, and is often brought about by a subnormal absorption of the anterior, in opposition to the posterior margin of the ramus ascendens.

Occlusal contraction of the maxillary arch can be brought about by deficient anteroposterior development in the apical base of the mandible, and distoclusion, aided by compression of the maxilla, by the efforts of the upper lip to meet the lower. When the maxilla is situated in posterior relation to the rest of the face, we have opisthognathism, as it is termed, and this is believed to be due to inadequate development of the intermaxillary bones. Cases of excessive mesioclusions are as a rule characterized by a large mandibular angle. A narrow palatine arch is, more or less, a marked deficiency in the development of the sutura palatina mediana, or of the region on both sides. This is generally accompanied by a disto- or mesioclusion, or open-bite. When the mandibular arch is abnormally advanced in relation to a normal maxillary arch, the chin projects forward in relation to the rest of the face, a condition known as progenie. The mandibular retrusion and maxillary protrusion, are anteroposterior defects, causing a postnormal occlusion in the former case, and a prenormal occlusion in the latter. Both defects are largely due to vicious habits. The overdevelopment of the jaw in the vertical sense gives rise to a certain form of open-bite, bringing about a nasomental exaggeration. Open-bite is known to be the result of sucking habits, or to an overpressure on the bone weakened by rickets, and is characterized by the linguoversion of the maxillary anterior teeth, which fully overlap the mandibular ones. Overbite is also characterized by lengthening of the mandibular and maxillary incisors in supraclusion, and their impingement upon the gums. Close bite may be due to deficiency of growth in the posterior part of the jaw, or too much growth in the anterior part. This vertical deficiency causes the diminution of the nasiomental dimensions. Mandibular malpositions are characterized by prognathism and retrognathism; these I have already discussed in regard to temporomandibular articulations. We find, therefore, that many of the abnormal relationships between the maxillary and mandibular arches are due to development defects of the bone.

This brings to a close the classification of the etiologic factors of malocclusion. We now realize how great is their number, and that they are inevitably linked with the general human system, and the health of the individual. The

most valued asset of any nation is the well-being of its people; and in order to conserve the health of the children, parents should be educated to some extent in these matters, so that they may exercise every necessary precaution. The human race is declining, morbidity is on the increase, and in general the span of human life is less than it was in bygone times. If we compare both the dental system and the dentofacial deformities of the children of today, with those of their forefathers, we see at once how very much worse off are the former. Are these conditions then, the expression of a phase of human evolution at its beginning, or do they represent in reality phenomena of degeneracy?

We observe around us quite a number of comely faces, but we must not forget that teeth as a whole, contribute more to the beauty of facial form, than does any other part of the countenance. Malposition of the teeth does enough harm in marring the beauty of an otherwise harmonious face, without adding the incalculable ills caused by inability to masticate properly, and thus opening up a chain of circumstances having far-reaching and disastrous consequences. Malocclusion leads to imperfect nourishment, which in its turn interferes with the development and growth of the individual, resulting in the production of unhealthy and physically weak children. Again, malocclusion is almost always accompanied by insufficient thoracic development, it weakens the essential functions of animal life; digestion and respiration; and is often one of the most dangerous predisposing conditions for tuberculosis. Dr. D'Alise, of Naples, and Dr. Guy, of Edinburgh, by measuring hundreds of children, have been able to supply absolute proof that those with malocclusions have narrow chests, and that proper masticatory function is an essential condition for the normal development of the respiratory apparatus. The muscles of mastication directly and indirectly influence the development of the face and soft tissues. Disharmony and lack of muscular use have a deleterious effect on the facial organs; therefore abnormalities of the dentofacial bones impair the masticatory and respiratory functions by obstructing or constricting the gateway to the respiratory tract, consequently causing a narrow chest.

Malocclusion can be the origin of focal infection (which is now universally recognized as the cause of many serious diseases) and also of pyorrhea alveolaris. Malocclusion of the teeth contributes more towards the ill-health of the human family than any other single factor. It should therefore be corrected as soon as it is observed, in order to safeguard the health of children, as well as that of adults. In each case the dentist should make it his duty to discover the etiologic factors. Let us follow in the trail of such able workers as Angle, Bogue, Hawley, Dewey, McCoy, etc., and *teach* the public, so that they may know what inestimable benefits have been bestowed upon humanity by the science of orthodontics. We want parents to realize the importance of the care of deciduous teeth, so that not only may the health of their children be maintained during their formative period, but also that the permanent teeth may come in true and proper order. We wish them to consider that the welfare of the child, not only in a health sense, but also from a social and business point of view, may be handicapped by their failure to appreciate the necessity for regulation when deformities exist. If children be given proper attention, the correction of malocclusion will follow; and they will develop normal and comely faces, and the improvement in their general health will tend to produce long and happy lives.

It is not alone for the individual that this is important, but also for the community at large, as it has been undoubtedly established, that the correction of malocclusion is a factor of moment in the health and prosperity of the nation.

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DISCUSSION

Dr. Etter, of Berlin, said that he had nothing to add to Dr. Bery's very scientific and complete paper; except that he wished to emphasize the importance of parents exercising proper control over their children in regard to pillowing and posture habits. He also expressed himself as in agreement with Dr. Bery's statement that during restoration in cases of caries, a hard substance should be used, in order to preserve the mesiodistal width. He had found many cases of malocclusion in children that were traceable to want of precaution in this respect.

Professor Dott Aldo Maggioni, of Milan, wished to thank Dr. Bery for his colossal work, in which he had discussed every etiologic factor of malocclusion, which Prof. Maggioni could call to mind. He wished that members of the profession would pay more attention to proximal causes, which had been so ably dealt with in the paper. He was in complete agreement with Dr. Bery, regarding the relation of the apical base to the teeth. Prof. Maggioni expressed his regret that the paper could not be read in its entirety, owing to lack of time; but he would look forward with interest to its publication.

Professor Angelo Chiaviarro, of Rome, thanked Dr. Bery for his painstaking efforts in presenting the classification of malocclusions in such an interesting manner, and was pleased to find them so well represented on a scientific chart. He very much appreciated his discussion on deciduous teeth, and wished to lay stress on the same, owing to the fact that while engaged on research which extended over 1,000 cases, he had found that if proper attention was given to children at an early age, and if the necessary corrections were made, the permanent teeth almost always erupted in normal occlusion. Professor Chiaviarro was glad that Dr. Bery had made special mention of the case of mesiodistal occlusion, as he had found it very prevalent in his practice.

Dr. Angelo Chiavaro, of Geneva, Italy, stated that he admired Dr. Bery's exposition of the etiologic factors of malocclusion, and that it showed how great a knowledge he had acquired in Europe regarding orthodontics; he felt that Dr. Bery would be, without doubt, very successful in his own beautiful country—"The Sunny India." Dr. Chiavaro considered that the etiology of malocclusions should be divided into two classes: (1) The etiology of malocclusions affecting deciduous teeth; (2) the etiology of malocclusions affecting permanent teeth. His reason being that one-third of the cases of malocclusion of the permanent teeth are due to malocclusion of the deciduous teeth. He further stated that in his opinion orthodontology is fundamental to the prophylaxis of dental diseases and to the development of children, and therefore fundamental to the public health.

The *President* thanked Dr. Bery very warmly for his scientific and most remarkable paper, and appreciated deeply the time he must have spent in collecting his material, and the extensive field covered. It had been his pleasure to meet, at various scientific societies, many of the eminent men mentioned. He stated that although much had been done in the field of biology, we had as yet been unable to discover the cause of bone growth. He would look forward keenly to reading Dr. Bery's entire paper, which would undoubtedly reveal some very interesting facts.

Professor Maggioni said that following upon a period of thought in mechanical directions, and much mechanical labor, orthodontics is at last working along biologic lines. We must not, however, discard mechanical methods; but we must understand and conduct our problems from a biologic point of view. Dr. Mershon has said, "Many times we preach biologically, and act mechanically." Such an attitude can but have a bad influence upon our prognosis; I refer to prognosis relating to the continuance in the future, of the results of our treatment. After carefully listening to the very excellent paper that our confrere, Dr. Bery, has read before us, I would propose from a prognostic point of view, that the etiologic factors of malocclusion be divided into two groups, differing materially from each other. In the first group I suggest that we place malocclusions arising, for instance, from: pernicious habits, belated loss of deciduous teeth, premature loss of permanent teeth, supernumerary teeth, faulty dental restorations, and so forth. I would also include adenoids, in the special sense of influencing the general metabolism. When we are confronted with such cases as the above, we find ourselves often in a position to bring about a real prophylaxis. If unfortunately we are called in too late for this to be possible—even then—after we have removed the causes, and performed the necessary orthodontic and biologic treatments, there is still the possibility of formulating a good prognosis in regard to the future stability of our results and the probability of a cure. In the second group of factors I would include malocclusions arising from: hereditary or racial conditions, metabolic (calcific) and endocrine disturbances, and the morphologic constitutional type, according to Italian conceptions (Professors De Giovanni, Viola, and Pende). When we have to deal with cases such as these, then our prognosis must be very reserved if we are to be honest biologically. Notwithstanding the fact that in these days we are using more physiologic appliances, and have a better understanding of anchorage, and that we interpose periods of rest during our work; we are still treating merely locally what in reality are expressions of general somatic conditions. If for instance, we have treated satisfactorily an Angle's Class II, and obtained normal occlusion and proper retention; then, although we have done much, nevertheless we have done nothing towards abolishing or counteracting, either vital impulses, hereditary, or the endocrine factor which causes our patient to develop in length instead of breadth, or to become dolichocephalic instead of brachicephalic. Again, let us suppose that we have successfully treated a median diastema between the maxillary incisors. Can we be sure that the correction will be permanent if the child's father shows symptoms of acromegaly?

Again, when we have decided that we have finished our treatment, can we assume that the delicate process of building, or rebuilding and growing bone—so scientifically demonstrated and taught by Hunter, and recently by Keith, Champion, and Professor Brash—has also ceased? It is just the same in general medicine. We find there many ailments which we can permanently cure, but on the other hand, there are many others (especially of the diathesic type) which, as soon as our treatment is over, or the special diet discarded, recommence and set at naught our best efforts. As a physician once said, in a rather synthetic vein: "There are cells which continue to cause diabetes, and other cells that continue to cause uricœmia." In the same way, we, as orthodontists, could say, that there are cells which continue to cause prognathism, and others retrognathism. In conclusion, I would say, with reference to the etiologic factors collected under my second group (sometimes influenced by unbalanced apical base), that our orthodontic-biologic attitude must be one of reserved prognosis, in regard to the persistency of the results of our treatment. In my own practice I find that this position is perhaps improving; for the reason that I employ—both during and after orthodontic treatment—calcific endocrine, and vitamin therapy. But my experience in this respect has been too short to allow of my drawing any general conclusion. It may be that some time in the future, the medical profession will find it possible, in virtue of improved methods and a greater knowledge, to make radical changes effecting morphologic constitutions, hereditary conditions, and rudimentary impulses. But for the present, in spite of the employment of most advanced methods in local and biologic treatment, we are constrained to continue our attitude of proper reservation, and are ever subject to limitations imposed upon our prognosis.

PHYSIOLOGIC EXERCISES AS APPLIED TO ORTHODONTICS*

By Alfred Paul Rogers, D.D.S., A.M., Boston, Mass.

THE accumulative effects of those ever present hostilities to progressive change, as may be seen in the established order of things, can never be set completely aside when a new idea begins to take root in the manifold processes of professional evolutionary thought. The history of medicine is replete with examples of bitter hostility to changes from the old to the new, but when the roots of growth spring from and draw their nourishment from principles which are fundamental, then the innovation gradually develops and becomes victorious in its conflicts with older methods of procedure. The reconditioning of the professional mind is often difficult and sometimes requires an extended period of time to overcome the unconscious hostility to change.

The newer orthodontics represents progressive change in mental conception and in methods of procedure. It requires of the orthodontist an open mind. A mind that readily recognizes that new methods are seldom if ever perfect at their inception. The newer orthodontics requires a mental alertness that readily grasps the essential difference from the old, and at the same time recognizes the immediate advantage to be gained by a careful study and faithful application of the new.

The newer method while it limits the employment of the mechanical, at the same time tends to amplify the importance of the mechanical. It endows the mechanical idea with a simpler yet essentially more scientific quality. The employment of the principles underlying the newer method gives a greater finesse while at the same time it reduces bulk. It diminishes quantity and the duration of use, demanding periodic instead of continuous employment. It establishes a harmonious and delicate interchange with the living orthodontic appliances nature has provided for our use.

Therefore, the picture that the careful student must endeavor to visualize is one of changing shade. A picture where careful evaluation of the various elements involved is very necessary. At times the mechanical must be allowed to fade almost entirely—again it becomes for a brief period the main element in the composition. When it fades it throws emphasis upon the nonmechanical. Those physiologic elements whose wonderful engines, the muscles, are endowed with self-developing power—the forces that encourage the development of more perfect function and more perfect form.

The following quotations from previous articles, I hope, will serve to call to your attention some of the ideas fundamental to the newer method of practice:

"Even a superficial reading of the history of orthodontia will reveal to the student that, up to the present period, the followers of this specialized branch of dentistry have given more thought to the development of mechanical appliances than to the search for methods of a more fundamental character."

* Read at the 1930 Congress of the European Orthodontological Society, at Zurich.

"The most valuable appliances are those which interfere least with the normal tendencies of development, and in their construction and adaptation are freest from interference with muscular activities and habit-forming possibilities."

"Careful study of the use of these delicate appliances may save the patient long years of application and possible discomfort. Thus ridding the teeth themselves of the handicap and improving their environment."

"If we are able to select the best mechanical ideas that we now possess and learn to apply them scientifically, we have, I think, sufficient for our present needs, or at least until we perfect our knowledge of the natural forces and educate ourselves in their scientific use."

"Whatever mechanical stimulation we choose to employ, we must follow it with the development of the function of mastication through muscular development. We must encourage also the development of the respiratory function through adequate and proper exercises. In each case applying methods most suitable to the character of the maldevelopment."

"The orthodontist should not forget that he is responsible for the health of the tissues immediately surrounding the teeth, as well as the health of the teeth themselves."

"The principles that underlie normal development and normal changes of the tooth positions must not be ignored or omitted from the plans of construction, or he will in some instances interfere very seriously with the normal processes of development."

"Having then before us the principles of procedure, we are prepared to consider their practical application. The principles are: First, the mechanical reestablishment of arch form and cusp relation by the simplest mechanical means, thus removing any interference which tends to discourage the normal function of the muscles. Second, the principle of muscular balance and mechanical advantage in the complete organism, including special guidance and control of those muscles concerned in the particular weakness upon which our attention is to be directed, urging them on to their normal development and strength until the harmoniously developed face completes the restoration of the organism to its normal inheritance."

"It is obvious that well-developed muscles are more beautiful in appearance. In fact there is no comparison in facial development and symmetry between the results obtained in those cases which are treated solely by mechanical interference, and those cases which have received a due amount of attention to the development of the various groups of muscles. Beauty of the facial contour is improved. The action of the muscles themselves is more normal and harmonious, and I believe that the results are more far-reaching than the face alone. Again the retentive value of a well-developed orbicularis oris muscle must be clear to you all. Consider what it means to have the internal muscles harmonious in their activity and influence. Consider what it means to the field of our special endeavor when we know that we are frequently bringing larger quantities of fresh nutrient-ladened blood to the parts."

"Malnourished children respond less quickly to treatment than those properly nourished, and the malnourished are found among all classes of people. Just here is an opportunity for coöperation. The undernourished child, who is suf-

fering from a high degree of irritability, is an unfavorable subject for dento-facial treatment. Yet, in many instances, it is just what the child requires as a preliminary to better health. Under such circumstances the physician may frequently render the child much more receptive to treatment by prescribing a suitable diet and enforcing general rules of health and body building, greatly assisting the child and making it possible for the corrective work to be carried on with greater assurance of success."

"The orthodontist, when undertaking the treatment of such individuals, will be wise if he looks carefully into their environmental surroundings, making careful inquiry into the habits of life such as eating, sleeping, playing and social contacts. When a careful investigation has been made, quite frequently it will be found possible to change some of these habits, substituting for them habits of life which may tend toward the building of a finer physical constitution."

"It has long been taught and generally accepted, that after the teeth have been placed in their normal positions of occlusion, and maintained for a more or less lengthy period, retention is assured as far as that is possible. This is far from the truth, because as already stated, unless the surrounding soft tissues are equally normal in development and action, the bony structure supporting the teeth will be influenced in some undesirable direction. The muscles of the face must perform their proper function, and in order to do this they must be strengthened. Strong muscles perform their function without fatigue and accomplish an unusual amount of work without a great deal of mental effort."

"The orthodontist has handicapped himself in the past by trying to gain results solely through his own efforts instead of pointing the way to personal self-improvement by the patient, ignoring the physiological forces which work under the direction of the mind in stimulating functional activity of the various organs which are essential to his complete success."

"Harmonious action of the muscle groups concerned is quite as important a factor as their increased strength. Mechanical forces alone only partially attain wished-for results. The muscles are 'living orthodontic appliances.' "

"Development brought about by increased function needs no retention apparatus, but development brought about by mechanical means alone must be retained mechanically until the muscular function has been well-developed."

"The successful practice of orthodontia depends not only upon the treatment of teeth and bone and muscles and the skilful manipulation of appliances, but upon the psychologic knowledge of the operator and the mental condition of the patient."

"The understanding of the normal processes of nature, coupled with an intelligent and cautious reeducation of the abnormal individual, is the scientific basis upon which modern orthodontics rests."

"As a biproduct in orthodontic treatment of this nature we find that there is produced a quality which is almost always lacking when treatment is undertaken purely by mechanical means, namely, the full efficiency of the function of mastication."

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SOME NEWER DESIGNS IN LABIAL AND LINGUAL APPLIANCES AND THEIR CONSTRUCTION*

By Ernest N. Bach, A.B., D.D.S., Toledo, Ohio

A VOLUME of material could be written if one were to go into detail regarding the various types and construction of appliances, but there are a few newer designs with which I have been pleased and these are the ones which I wish to present for your consideration.

Reversing the general order of presenting appliances and their construction, I wish to show the finished appliance first. In this manner a clearer concept may be had of the appliances as a whole while their technic of construction is being described.

There are many designs of appliances, but in reality there are basically but two kinds, namely, the labial and the lingual appliance. To be sure, there are variations in the design. For example, we have the Jackson appliance, a truly removable type; the removable lingual arch; and the fixed or soldered lingual arch. To the plain labial and lingual appliances have been added any number of auxiliary attachments, such as springs, bite planes, etc. Some operators find that certain attachments will produce their desired results while others use different means to obtain similar effects. Some desire one type of appliance to the exclusion of the others, and vice versa. On the other hand, many men use a combination of both the labial and lingual appliances. I find that most of my cases are treated with a combination of the two. It has been a rather routine procedure to use this combination with various auxiliary spring attachments as the case may call for. I use a lingual arch because of its apparent effect of stabilizing the banded molar teeth. If no auxiliary attachments are needed, a soldered lingual arch is very often used, but a removable lingual wire is especially indicated where spring attachments are desired. The reasons are obvious, i.e., additional springs may be added without removing the molar bands, more accurate adjustments can be made, and time is saved in repair.

This combination of appliances is especially preferred in cases with constricted arches and their resulting sequelae. The lingual arch and its auxiliary attachments serve their purpose well for stimulating lateral growth in the molar and premolar regions, and the labial arch for obtaining movements of the six anterior teeth.

Since we are not dealing with diagnosis, that important phase of the subject will be omitted.

APPLIANCE USED IN ACTIVE TREATMENT

I am assuming all through this paper that molar and other bands have been previously made by one method or another. Our molar bands are either seamless or pinched joint, fitted directly, and all contouring—with the exception

* Given before the 1930 Congress of the European Orthodontological Society at Zurich.

of the occlusal edge which is finished before the impression is taken. After the model is finished with the molar bands in position, the occlusal edge is contoured with a very small hammer and the interproximal edge is sometimes ground down with a stone, thus avoiding interference with the opposing tooth depending upon occlusion.

One of the two designs of lingual appliance which I am more or less partial to is the one shown in Fig. 1. This appliance is designed to obtain lateral movement of the premolars by the use of the loop springs and movement of the molars with the high palatal removable lingual wire. I prefer the use of the high palatal

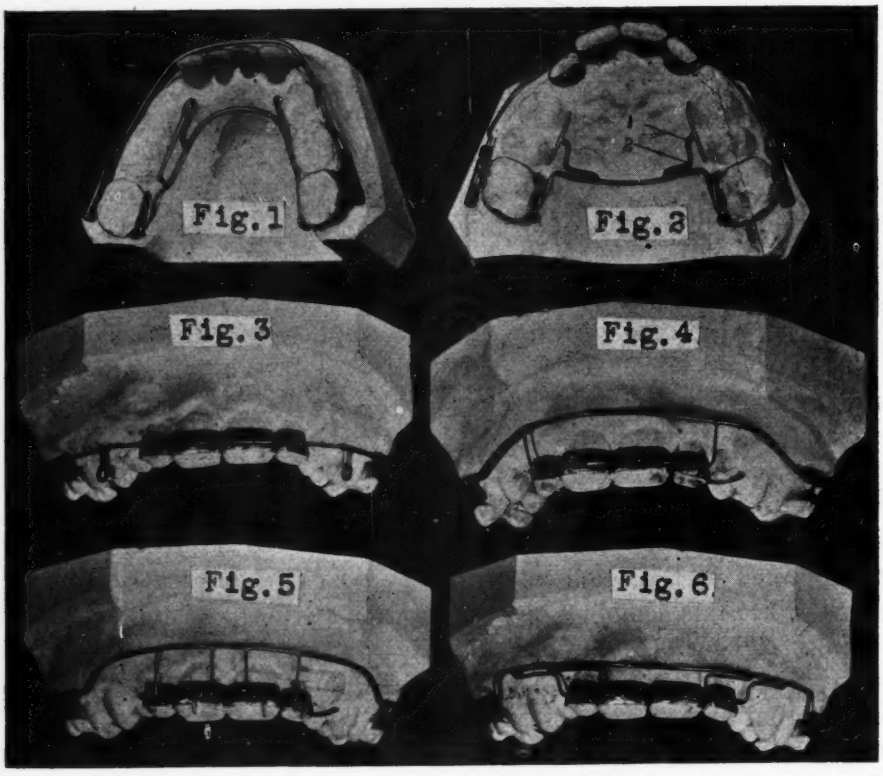


Fig. 1.—Showing the loop spring used for expansion soldered to the lingual removable arch. By straightening any or all three of the bends in the spring, expansion may be gained in this region.

Fig. 2.—Showing the high palatal arch with finger springs of 21 gauge, on the ends of which are soldered smaller springs of 23 gauge. By opening the right-angle bends in the larger wire and bending the free ends of the smaller wire, expansion may be gained in the premolar region.

Fig. 3.—Showing the 0.022 in. round wire which is used for aligning the anterior teeth before root movement is attempted.

Fig. 4.—Another method of aligning the incisal edges of the anterior teeth. An 18 gauge or 19 gauge high labial arch is used with the 0.022 in. wire soldered and attached as shown to engage the bracket bands.

Fig. 5.—The high labial arch on which are soldered long finger springs to engage the bracket bands. The arch wire being 18 gauge or 19 gauge and the finger springs 0.022 in.

Fig. 6.—Another method of obtaining apical movement by use of the high labial arch and finger springs of 0.022 in. wire with a section of bracket wire soldered on the ends of the bracket bands.

wire to the customary lingual wire which usually lies in close proximity to most of the teeth at the gingival contact. In other words, the older types of lingual arches followed the general shape of the tooth alignment and rested at the contact of the gingiva and the teeth including the anterior teeth. The main objec-

tion to this design found in my experience is that it is a decided hindrance to speech and mastication, and of no special importance in that location. That is why the design of the high lingual arch shown in this illustration is itself of more practical value. It is much shorter from molar to molar than one which would follow the outline of the lingual surfaces of the teeth and consequently is more rigid for spring attachments.

The main arch wire used here is 19 gauge or 0.036 in., and may be made of any noble metal material with good spring qualities. If desirable—and it is often preferable—an 18 gauge wire may be used. The main wire should be removable and any kind of lingual lock may be used. The one used here was designed a number of years ago and has its faults as well as its good qualities. A description of its construction and materials may be found in the INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY AND RADIOGRAPHY, September, 1922. Half-round pin and tubes prove very satisfactory.

The loop springs shown on either side are bent with round-nose pliers and shaped as indicated by the illustration. They are made of 21 gauge round wire. The extensions soldered on the end of the loop spring which engages the mesial of the premolars, act as increased resistance when the labial arch is used to produce anterior movement of the incisors. This has been described in one of our journals a few years ago, and no more mention will be made of it here except to say that both ends being soldered to the lingual arch prevents distortion from forces exerted during mastication and can be controlled exceptionally well. A loop spring of this nature for retention does very well in the mandibular anterior region provided the wire rests on the flattened lingual surface of the incisors and not at the gingival margin.

There are a number of individual springs which may be soldered to the lingual arch for various needs which I am sure each of you can easily prescribe for your particular case.

Fig. 2 shows the other type of springs for expansion purposes which have been very useful. The high palatal removable wire has again been used and a 21 gauge round wire so bent and adapted with the round-nose pliers that the free end rests about midway between the premolars. Another piece of the same wire is soldered to this spring which engages the premolars. Expansion in both this and the loop type of spring is gained by opening the loops Nos. 1 or 2, and additional pressure may be made by bending the free ends of the wire soldered to the spring shown by this illustration.

As nearly as I can determine from observing the results of various operators, stimulation from auxiliary spring wire is mostly to be desired. However, producing spring pressure and controlling that same pressure are two different things.

Dr. Eby, some few years ago, advocated a more rigid wire for spring pressure. He made this assertion at a time when light auxiliary springs were being more widely used, and it seemed at the time of this statement that little movement would be obtained from a rigid spring. In many instances I am in accord with the use of stiffer springs. In the first place, adjustments are quite positive; and in the second place, they are not so easily displaced by forces during mastication as the lighter unprotected ones. On the other hand, a short light

spring may surprise one by its effectiveness, and in many instances one has been used for each tooth between the first permanent molar and the lateral incisors for expansion purposes.

Springs may be—and very often are—designed to embrace three or four teeth, and it is obvious that one sufficiently long to engage this number of teeth would not control individual tooth movement as ideally as the individual spring. Surely one spring may very well be adapted for two teeth, but the more teeth we attempt to control with one spring, the more difficulty will be encountered in adjustment and stability.

Lateral springs for expansion usually prove effective. Trying to stimulate growth in the anterior region by the use of lingual spring pressure has not been as satisfactory in my hands as the use of the labial arch. Although various spring designs have been used for anterior teeth well protected by short lugs soldered to the main wire, it is found that the springs slide on the lingual incline toward the incisal edge when the arch is displaced away from the soft tissues by the tongue or other forces. Too great a pressure on these springs will also produce this crawling motion. Once these anterior springs have taken this new position and remained there for some time, we may expect a tipping of the incisors anteriorly, and of the banded anchored teeth (usually the molar teeth) distally. A remedy which is suggested here would be to band some of the anterior teeth, and to solder lugs to the lingual surface of the band to engage the lingual arch or the free end of the springs. In this manner the whole appliance would be stabilized as well as the free end of the springs placed under better control.

Fig. 3 deals with labial arch design. Here we wish to suggest only one or two methods which we like in aligning and producing root movement of the anterior teeth.

The teeth to be moved bodily are first banded with angle bracket bands. These teeth are brought into their approximate incisal alignment by the use of a 0.022 in. round wire, the late Dr. Hawley's method. Instead of using the 0.022 in. round wire from molar to molar, a 19 gauge (0.036 in.) round wire is used from the molar to the region of the canine on either side and these two connected by the 0.022 in. wire which engages the angle bracket bands. The application stands up better under service with this design than when the 0.022 in. wire only is used. Again we may use a section of 0.022 in. wire to engage the angle bands having the ends soldered to a high labial arch, thus forming a "double labial arch" or loop for that block of teeth. This design is more rigid than the previous one, and is shown in Fig. 4.

Assuming in Fig. 5 that the incisal alignment has already been obtained, the 0.022 in. wire is replaced by a high labial arch of 18 or 19 gauge to which are soldered long 0.022 in. round wire finger springs. These springs nearly parallel the median long axis of the tooth, extending to the bracket on the band where they are bent at right angles, passing through the bracket and again bent at right angles toward the incisal edge of the tooth. By bending the wires in the desired direction any movement of the tooth with the exception of a lingual movement of the apices may be obtained.

Fig. 6 illustrates another method of obtaining apical movement of anterior teeth after the incisal edges are in approximate alignment, as described in the

Hawley method. This procedure involves a labial arch of 18 or 19 gauge round wire which lies a few millimeters rootwise from the cervical margin. Round spring wires 0.022 in. are soldered to the labial arch, eight to ten millimeters distal to the tooth to which pressure is to be applied. This spring lies in close proximity to the labial arch, extending to the desired tooth where it is bent incisally at right angles and cut off even with the bracket on the band. The end is then soldered to a piece of flat wire 0.022 in. by 0.036 in. which is lying in the bracket portion of the band. The flat wire extends only a millimeter or so

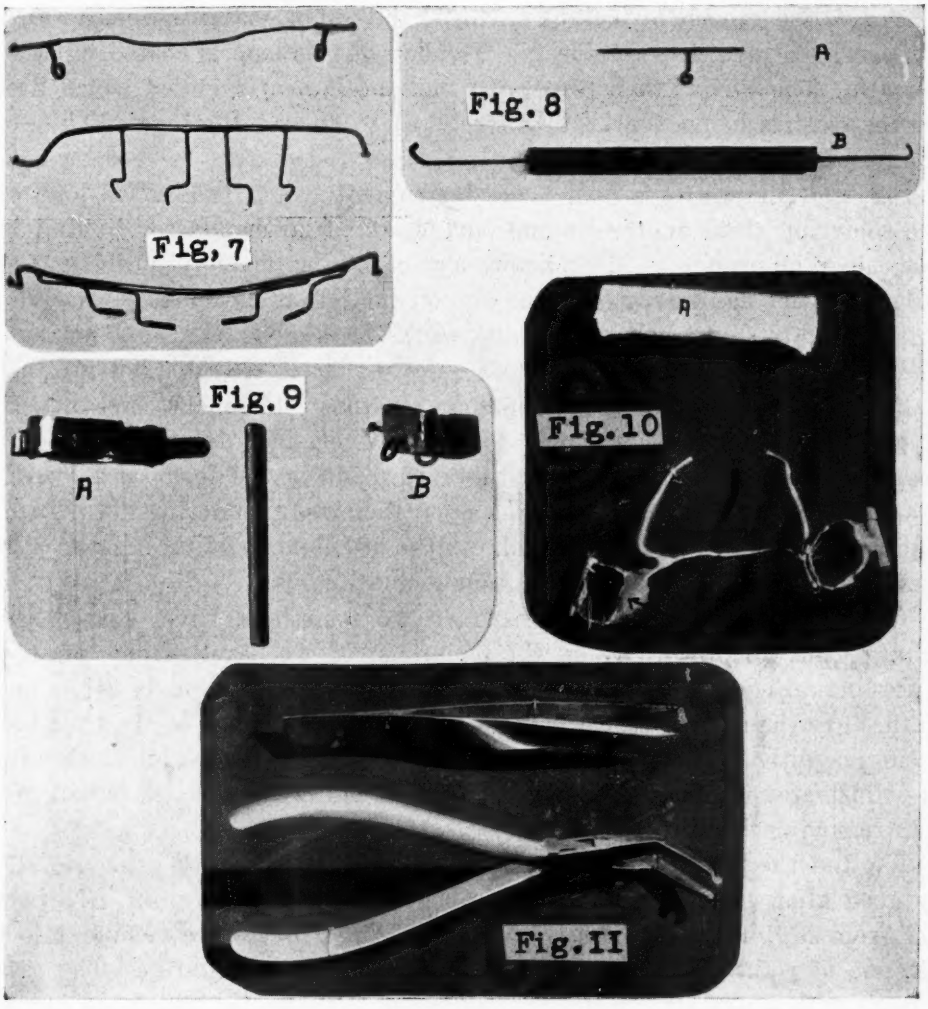


Fig. 7.—The three labial arches which were used on the preceding models.

Fig. 8.—*A*, The hook for rubbers, described in the text. *B*. An orange-wood stick in the ends of which are steel needles. The one on the left is flattened to hold half-round tubes while soldering to molar bands. The right one is to hold round tubes.

Fig. 9.—*A*, The bevelled tube on molar bands for easier insertion of the lingual arch where the locking wire is used to hold the pin in the tube. *B*, A loop soldered to the band for ligating to rotate or engage finger springs. Wire 23 gauge.

Fig. 10.—*A*, A cotton roll which has been covered with gauze to prevent shreds of cotton from being caught under molar bands while cementing bands to teeth. *B*, Lingual locks are covered with soft wax before cementing bands. This prevents cement from working in between the fine wires. The left side illustrates the point.

Fig. 11.—The upper figure illustrates a pair of soldering tweezers which have been grooved on the end. These are used to aid in adapting labial arches by heat. The lower illustration is a pair of S. S. White Howe pliers No. 111. The ends are grooved two ways. One groove parallel with the long axis of the handle and the other at right angles to the handle, making it convenient to handle round wires without slipping.

beyond the bracket. All apical movements of these banded teeth are thus possible, and the small spring wire is used to produce the gentle pressure.

Fig. 7 illustrates the three labial arches just described. The upper one shows the two sections of 19 gauge (0.036 in.) round wire connected by the 0.022 in. wire; the middle arch, the one on which finger springs are soldered extending to the incisor bands; and the lower one shows the finger springs on which have been soldered the section of the angle ribbon arch 0.022 in. by 0.036 in.

Ofttimes, when intermaxillary elastics are used, they become unfastened from the hooks when the teeth are in occlusion—illustrated by Fig. 8 *A*. This can be greatly overcome by making a loop on the end of a 20 gauge wire which extends nearly to the line of occlusion. The end of this loop is heated until a ball is formed. The wire is then bent until the loop is nearly closed which necessitates the elastics being very thinly stretched to engage the hook. These very seldom come off.

Fig. 8 *B* illustrates a homemade instrument which is used to hold tubes while soldering them on the lingual surface of molar bands for lingual locks. It consists of an orange-wood stick with a steel needle driven into each end. The needles are bent as illustrated. The one on the left is flattened out (while red hot) and filed to hold a half-round tube, while the other is left round for holding round tubes. The tubes are easily and quickly placed with this holder.

Fig. 9, right side, illustrates spurs for ligature attachment. Whenever any lugs or spurs are soldered to bands and wires where it is desired to attach ligatures or engage elastics or springs, they are made in the form of a loop from 21 gauge or 23 gauge wire (depending upon their use), soldering both free ends to the desired material. The loop allows the attachment of the ligatures in all directions and is less irritable to the tongue and lips.

To overcome a little difficulty which we sometimes have when inserting lingual arches into the tubes on the molar bands, we bevel rather bluntly the occluso-lingual edge of the tube so that while the pin portion is being pushed into the tube the locking spring wire is sliding over the edge of the tube toward the gingiva without being distorted, where it eventually snaps into locking position—illustrated in Fig. 9, left side. A drop of Nujol on these parts will greatly aid in removing the pin later on.

We find the S. S. White Howe curved plier with smooth beak, No. 111, a very good plier when handling wires. Fig. 10, lower illustration. To prevent wires from slipping when held by the pliers, two grooves are ground into each beak, one at right angles and the other parallel to the handles. The grooves are made with a steel drill a little smaller than the wire for which the pliers are intended to be used. Likewise, one pair of soldering tweezers are notched on the side near the points to aid in adapting labial and lingual arches when bent by heat. Fig. 10, upper illustration. A slate pencil also aids in holding lingual arches while being heated.

Fig. 11 illustrates a helpful measure when cementing appliances. Before appliances are placed in the mouth and cemented, it is customary completely to cover all the lingual lock and all the small connecting wires with soft pink wax such as is used by supply houses for mounting artificial teeth. This pre-

vents cement from entering the small spaces between the wires and obviates the necessity of removing the cement after it has set.

I have followed a suggestion which Dr. Porter left with me a few years ago, of covering cotton rolls with gauze and using them to keep the teeth dry when cementing appliances. One does not have fine shreds of cotton being pinched and cemented under the bands following this method.

FACTS OF IMPORTANCE IN TOOTH MOVEMENT*

By Charles F. Bowles, D.D.S., Richmond, Va.

THE fact that under certain conditions malposed teeth, either singly or collectively, may be moved into their correct positions and tha maldevelopment of the dental arches may be corrected and a normal functional condition established, is known to every student of orthodontia.

On account of this, it behooves us to have as clear an understanding as possible of the material with which we are to deal, so that we may at all times keep in mind that we are stimulating growing, living tissue and endeavoring to assist nature in its development of the arches and associated structures, so that by this development they may be of normal size and position so as to function and carry on their integral part in the body as was intended by nature.

It is too often a fact, and a lamentable one, that tooth movement is undertaken by those who have only a vague idea of the vital process involved within the tissues to be dealt with, and their sole aim is one of a mechanical nature. The fact that the vital process with which we deal will withstand so much abuse from faultily constructed and misapplied mechanical appliances, is no justification for the act, for far too often this trespass on the fundamental laws of physiology will be manifest in later years in a disastrous way. Bone is considered a functional tissue, and nowhere in the human make-up is this more perfectly demonstrated than in the bony structures of the mouth where the alveolar process appears with the teeth, is arranged to support them regardless of the position they may occupy, and disappears when the teeth are lost. The structure of the alveolar process is organized in anticipation of a definite function to harmonize them. The growth of the different parts is not uniform in all directions, and the sources of growth are not uniformly distributed. Under normal conditions these differences in the rates of growth are harmonized by the specific function of mastication. It should, therefore, be apparent to the orthodontist to learn the means whereby the benefits of orthodontic operations may be realized, that halfway methods will result in eventual failure. When corrective measures are instituted, they must be carried to the point where the teeth, dental arches and associated structures are restored to the relationship which will make possible their normal use in the varied functions they are supposed to perform. We know that when this end has been attained we cannot feel that the benefits will be permanent unless the process has been carried out in a manner to make the developmental changes adaptive to the physiologic and functional requirements of the human mechanism as a whole.

The recent studies in the development of the face by Dr. T. Wingate Todd of the Western Reserve University, Cleveland, Ohio, has brought out

*Paper presented before the American Board of Orthodontia.

some remarkable facts in regard to our problem, and could they be correlated and adapted to the science of orthodontia, they would be of inestimable value in aiding us in the successful handling of our problems. We have been placing too much importance on the possible end-results to be obtained from mechanical interference without considering the inherent tendency of growth and development as it may be applied to the particular discrepancy we are endeavoring to correct. Dr. Todd states the fact that bone is ever changing in modeling and that we must never be misled by the hardness of bone into thinking of it as something permanent like marble. It is a living tissue, subject to constant change, and we must think of it as a process of remodeling, of erratic dimensional increases in this area or that and consequent necessary adjustment of the various parts. The investigator has also shown us by the unique method of superimposing the diagrammatic charts of development at different ages one upon the other, how different dimensions or directions of growth are taking place in the maxilla and mandible, while other areas of the same bone or bones are at a standstill.

The experiments of Oppenheim and MacEwen should be considered of paramount importance in the light of what has already been said in regard to the physiology of bone in explaining the tissue changes incident to the movement of the teeth. There is a certain amount of oscillation between bone building, bone destruction and bone rebuilding to maintain equilibrium so that as an adaptive tissue bone is never allowed to become more bulky than is necessary for function. And this bony tissue reacts to pressure or stimulation by a transformation of its entire architecture. It must be borne in mind that this reaction is the result of the application of the mildest stimulating pressure, and the bone seems to build up a resistance, as it were, to retard any change in development when the pressure is too great. On account of the fact that bone reacts so definitely to the stimulation of properly applied pressure, it is incumbent upon the orthodontist to consider carefully any contemplated tooth movement, so that when the pressure is applied in the right direction, this pressure will react only in the true sense of a stimulation, and through this, bone growth or development will take place. To do this, the mechanism to furnish this stimulating pressure must be carefully planned to carry out this idea and to have force under control at all times. If we fail to observe these precautions, not only may we fail in our treatment but we shall lower the proliferating power of the tissue so that a long rest will be necessary to restore the tone to the injured tissues.

MacEwen has very well explained the necessity for early treatment in the statement that "The younger the animal, the greater is the proliferating power of the bone cells and the longer will it continue to proliferate before it assumes its mature form. Consequently, the greater is the ossific production. The proliferating power of the osseous tissue of old animals is greatly reduced compared with those of animals in the evolutionary period and the osteoblasts which are poured out from them pass quickly into their natural form. The bone forming power of animals of the same species varies. Not only are there marked individual differences, but there may be marked variation in the proliferating power in the same individual in the same year."

To my mind, with these facts of sound reasoning to guide us in our work, I see no reason for continued trespass on the accepted laws of growth and development as they apply not only to the dental organ but to the human body as a whole, for we know that should we produce an injury to the teeth, underlying bone, peridental membrane or associated structures, we shall cause systemic manifestations involving the whole body.

In considering a few basic features in the manipulation of our mechanical appliance, I am confident of the fact that most of us alter our appliances much too often and thereby defeat our own purpose through being overanxious and not allowing nature time to respond to the stimulation before we break up the crystallization. All of us have seen patients of ours, who, for one reason or another, have postponed their visits so that we only see them several times during the year, get along much better than the average patient whom we treat every month or oftener. I believe one of the most important periods of our treatment to be the time so commonly referred to as the rest period, when we remove all appliances. During that time no great amount of movement can be made and thereby the tissues are given a much needed rest to allow them to regain their tone, and under function allow for the readjustment of cuspal relationship, and changes to take place as intended by nature for the particular individual. In my practice, through close observation I often see remarkable examples of the constancy of development, to the point that it is almost unbelievable. I have particular reference to certain periods of treatment when apparently no change takes place at all over a long period of time, and then it is like a seed beginning to sprout—a marked development takes place over a very short time. This is particularly noticeable during the transition period when the deciduous teeth are being lost and the permanent dentition is progressing.

RECORD OF TREATMENT, AND SUBSEQUENT HISTORY OF A CASE OF MALOCCLUSION AND FACIAL DEFORMITY, CLASS II, DIVISION 1 (ANGLE), 1915-1930*

By Frederic T. Murlless, Jr., D.D.S., Hartford, Conn.

IN PRESENTING this case for consideration it is felt that it will be of interest on account of the extended period of time which has elapsed since the end of treatment, and the opportunity thus afforded for the comparison of the four sets of models and the accompanying photographs. These very definitely demonstrate the value of orthodontic correction and the progressive influence of a correct denture upon facial development.

Fig. 1.

At the time at which the case presented, in October, 1915, the patient was a girl fifteen years of age. She had been having, up to a few months previously, a very creditable record in school work, but at the time when the patient presented, the parents had noticed a disturbing lapse of interest on the part of the patient.

Complete and thoroughly erupted permanent dentures were present, with the exception of the maxillary and mandibular third molars. The mandibular incisors were in contact with the maxillary mucous membrane and had produced recognizable ridges and depressions in it.

*Presented as a part of the requirements of the American Board of Orthodontia.

There was a history of long-continued thumb-sucking. For years mouth breathing had been habitual.

The tonsils and adenoids were present, and in such condition as to demand surgical interference. This was not given, however, on account of the expressed reluctance of the parents.

A history of infantile malnutrition was assumed to be the predisposing cause of the malocclusion.

Fig. 2.

Impressions and photographs in four positions were secured. Unfortunately roentgenograms were not secured as would have been done in these later days.

There was a bilateral distal malocclusion which was diagnosed as Class II, Division 1 (Angle).

The treatment indicated, included the distal tipping of the maxillary premolars and molars; the buccal movement of the maxillary first molars, premolars and canines; and the lingual movement and tipping of the maxil-

lary incisors. The mandibular teeth required corresponding movement, and the rotation of the right canine and of the left second premolar.

The further treatment included the correction of the occlusal relation, on account of the decided incorrectness of the curve of Spee.

The case was treated by means of the Angle pin and tube appliance with arch ends, the bands being placed on the maxillary incisors, canines and first premolars.

Angle clamp bands were placed on both mandibular and maxillary first molars. The Angle E arch was used with wire ligatures on mandibular in-

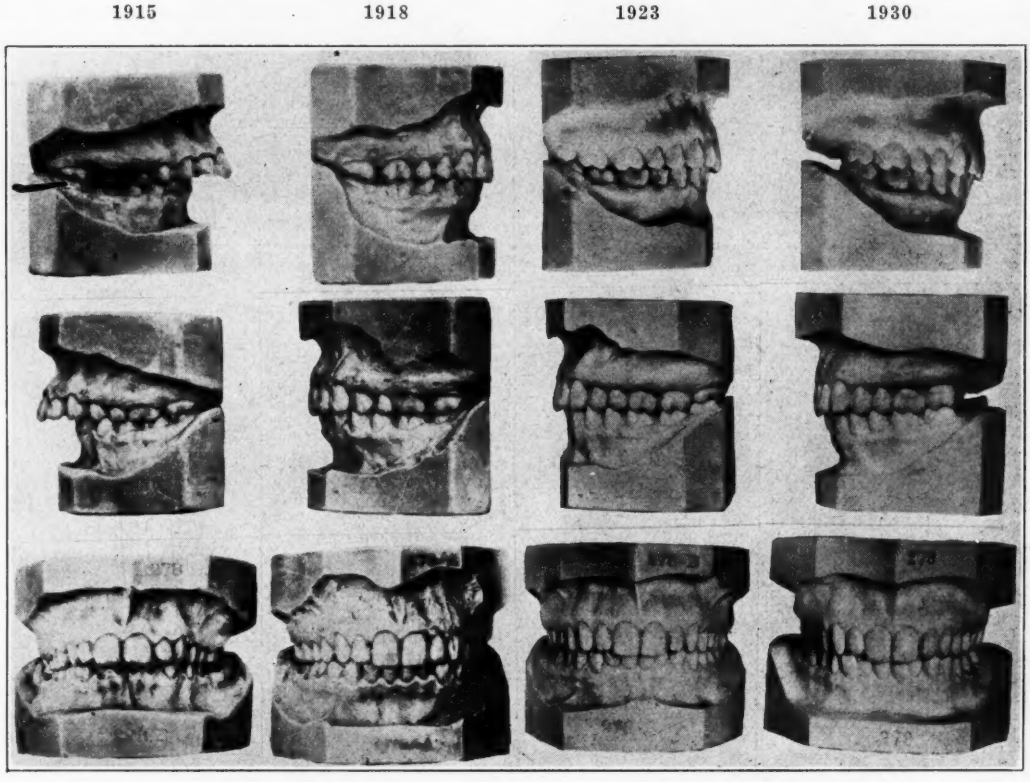


Fig. 3.

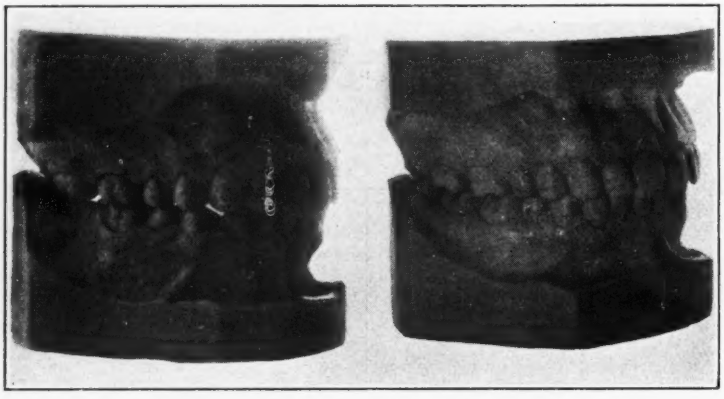
cisors, canines and premolars. The right canine and left second premolar were banded for rotations.

The E arch was bent to depress the incisors and to elevate the first molars and premolars. Intermaxillary elastics were worn bilaterally following partial buccolingual development. Later the pin and tube appliance on the maxillary teeth was replaced with an Angle E arch for continuing intermaxillary treatment. Gradual elimination of intermaxillary force, and intermittent use of appliances constituted the only means of retention until the patient was discharged as cured.

The treatment and retention periods covered less than three years. The marked improvement of the profile and lip relation at the end of treatment is scarcely greater than that shown by comparison of the profile relation of the photographs of 1923 and 1930.

The photographs of models and of the patient show results at the end of treatment in contrast with the original condition. (Figs. 2 and 3.)

The record shows that the four third molars were erupted in good position during the period between 1918 and 1923, and that these teeth were removed between 1923 and 1930 on advice of her dentist.



1918 1923

Fig. 4.

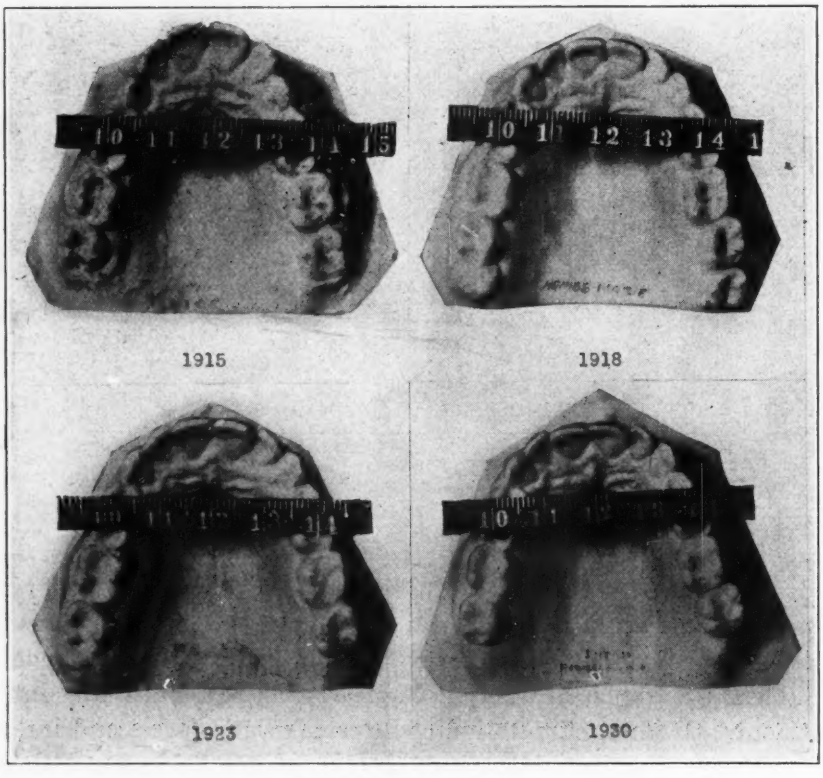


Fig. 5.

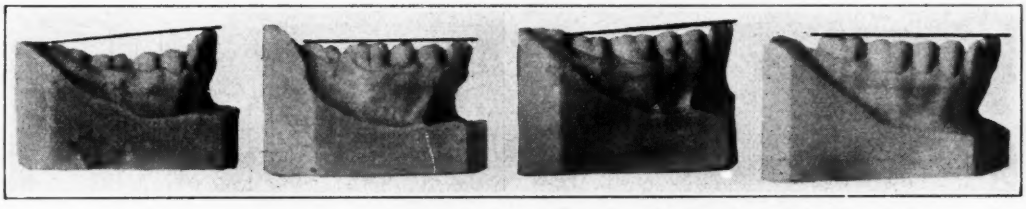
Comparison of photographs and models taken in 1918 at the time of completion of treatment, and afterward in 1923, and again in 1930, discloses the degree of success achieved and the degree of its permanence, and justifies the favorable prognosis recorded at the time of the removal of appliances.

It is much to be regretted that roentgenograms of the teeth of this denture at the time of the beginning of treatment and again at its termination are not available for examination. Roentgenograms taken in 1930, however, disclose no abnormality or pathologic condition of bone or tooth root.

Comparison of the 1918 models taken at the end of retention with the 1923 models shows that great improvement in interdigitation followed the removal of appliances. This is due, doubtless, to the correct placement of molars and premolars buccolingually and in relation to their normal position in the curve of Spee, and to securing occlusal contacts within the range of functional influence. This is shown in the accompanying pictures of the profiles of the 1918 and 1923 models by means of the special lighting used in photographing the 1918 and 1923 models (Fig. 4).

It is worthy of comment that concurrently with the eruption and removal of the four third molars, there have been but slight changes either in (1) the buccolingual distances between the canines and also between the premolars, or in (2) the relation of the maxillary and mandibular teeth, or in (3) the form of the curve of Spee.

The definite interdigitation of the denture has facilitated, to a great



1915 1918 1923 1930

Fig. 6

degree, the placing of fillings with unusually good approximal contours wherever these have become necessary. The correction of the occlusal relation may be believed to have been an incentive and guide to accuracy in these dental operations.

The patient is the mother of two children, the older of which is a son of four and a half years, whose deciduous denture is quite correct mesiodistally, with the overbite and distribution of the incisors normal for his age.

Without doubt it will be of interest to secure other records of the trend of the denture at a later date for the purpose of further comparison of these details.

Grateful acknowledgment is made of the cooperation of the patient, whose natural aversion to publicity of any sort was generously waived to make this presentation possible, in the hope that the benefits of orthodontia might be the more widely understood.

CASE REPORTS*

By Russell E. Irish, B.S., D.D.S., Pittsburgh, Pa.

CASE 1.—The patient was a boy, thirteen years old. The case was classified as a mesioclusion, Class III.

The family history showed that the mother was a glandular patient and the father was tuberculous. The rest of the family history was negative.

The patient gave a history of tuberculosis. Examination upon presentation showed that there was a lack of facial symmetry. The patient was subnormally developed, i.e., he was underweight, there was metabolic disturbance, respiration was abnormal, the maxilla was underdeveloped. The boy was very conscious of his condition and was suffering from an inferiority complex. He was two grades below the usual school standing for a child his age.

All the maxillary teeth were lingual to the mandibular teeth. The mandibular premolars were unerupted because of insufficient space.

Fig. 1.

Fig. 1 shows photographs taken upon presentation of the patient for treatment. Note the marked protrusion and pronounced facial asymmetry.

Models of the case made before treatment was started are shown in Fig. 2. These were made at the time that the photographs in Fig. 1 were taken.

Fig. 3 shows occlusal views of the maxillary teeth before and after treatment. Fig. 4 shows models made after treatment. Note the change toward normal occlusion.

In Fig. 5 photographs which were taken after two years and eight months of treatment are shown. Note the marked change in facial symmetry and the marked correction of protrusion.

In the beginning I was more or less doubtful as to the results of the treatment because the conditions accompanying the clinical evidence did not promise a lot; however, the results were gratifying.

Aside from the physical change, there was a pronounced favorable mental

*A part of the work required by the American Board of Orthodontia.

change. The inferiority complex was erased, and an apparently new mental lease on life was manifest with an added courage to live and to progress.

Labiolingual appliances with intermaxillary elastics were used in the treatment. Appointments were made at intervals of three and four weeks. The appliances were adjusted whenever necessary. The treatment was carried on over a period of two years and eight months.

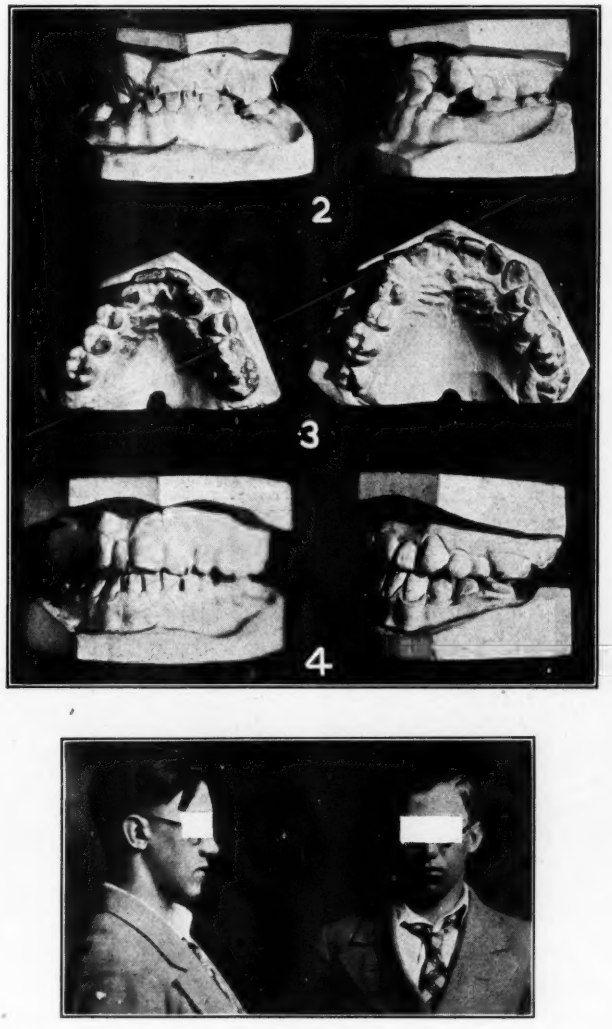


Fig. 5.

Case 2.—Patient was fourteen years of age. Case was classed as neutroclusion, Class I.

There were no indications or manifestations of inherited factors in this case.

The patient showed normal body development for age, metabolism was normal, patient was alert mentally and very active, and his scholastic standing was better than the average.

At presentation the maxillary canines were unerupted and lingual to the maxillary central and lateral incisors.

Note in Fig. 7 (left) the relation of the lateral incisors to the maxillary first premolars with the accompanying lack of space for the canines. The history of the case would indicate that the condition was caused by premature loss of the deciduous teeth and the physical disturbance of the canines during the developmental period.

Fig. 6 shows an x-ray picture taken during a previous period of treatment. After two years' treatment the case was referred to me with little progress, as shown from the x-ray picture.

In Fig. 7 are shown x-ray pictures of the right and left maxillary canines after a period of treatment. Note from these pictures the space at this period.

Fig. 6.

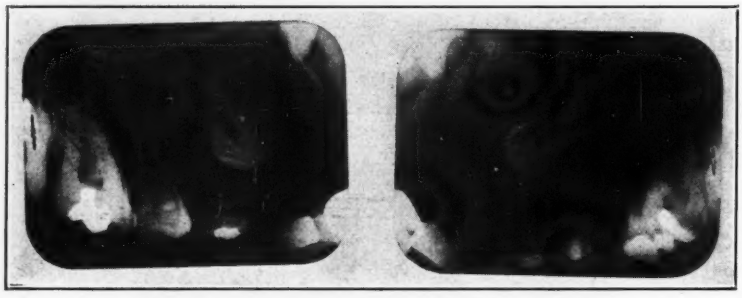


Fig. 7.

Fig. 8 shows the occlusal view of the case before and after treatment, with canines in fair relation in line of occlusion.

Fig. 9 shows at the left the model of the case before treatment, and at the right the case at the conclusion of treatment.

The case as shown was under treatment for a period of three years and four months. Before operating for movement of the canines, sufficient space was first created for them.

Alternately lingual and labial appliances were used with auxiliary springs in proper relation to attachments placed on the canines.

Appointments were made at intervals of three to four weeks, and the appliances were adjusted as necessary.

CASE 3.—Patient was thirteen years of age. Neutroclusion, Class I.

The family history and the personal history of the patient were favorable.

When the patient presented for treatment, there were two supernumerary teeth lingual to the maxillary right central incisor; their relative positions are shown on the model in Fig. 11 (left). The supernumerary tooth nearest the line of occlusion as shown in the model was immediately lingual to the normal central incisor. The case history would indicate that there was some congenital, proliferative disturbance in the germ plasm of the teeth.

In Fig. 10 x-ray pictures of the case show the position of the supernumerary teeth and their relation to the normal maxillary central incisor.

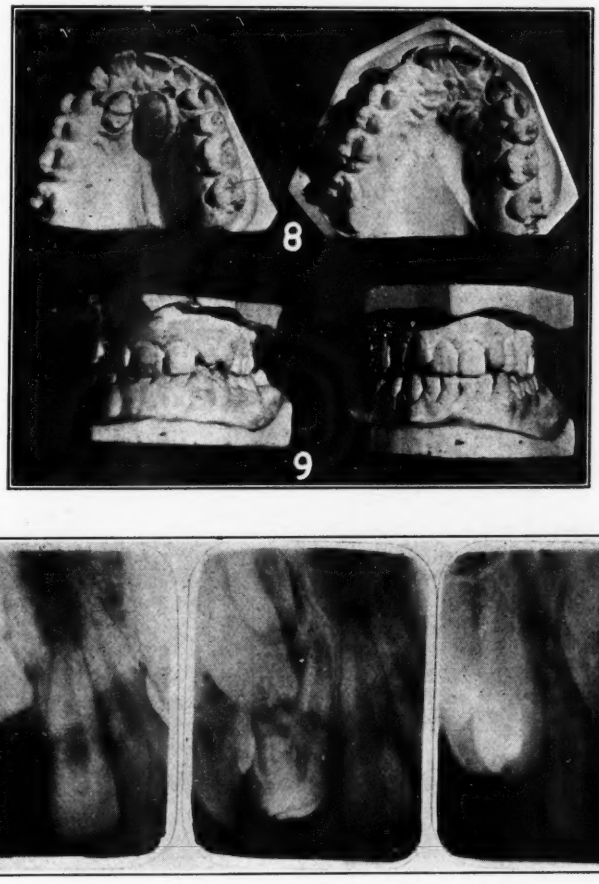


Fig. 10.

Fig. 11 shows (left) the supernumerary teeth after extraction, in relative positions on the model (right), model of the case after treatment showing occlusal view with maxillary right central incisor in position.

Fig. 12 shows models of the case before and after treatment.

The case as shown was under treatment for a period of five months. After removal of the supernumerary teeth, a lingual appliance to which an extension was soldered to cover the area of operation was placed in position. At this instance a wax pack was inserted and firmly held in position by the extension, thus allowing the wound to heal by granulation.

At the proper time a spur was attached to the canine, and a lingual appliance with an auxiliary spring attached was used to stimulate movement of the central incisor. Later, combined lingual and labial appliances were used

with auxiliary springs attached. At the first insertion the wax pack remained undisturbed for two weeks.

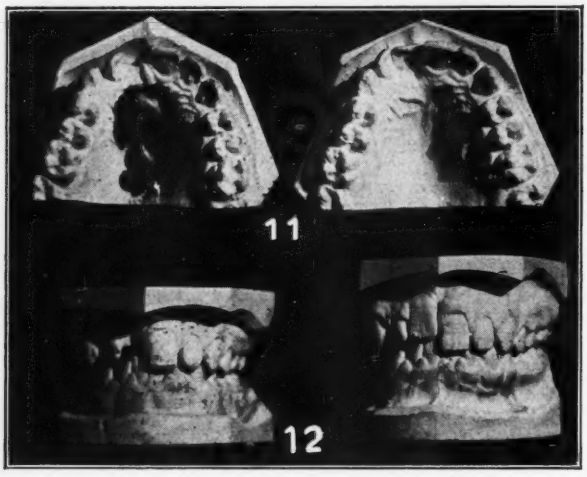
Note in Fig. 12 that the right maxillary central incisor is still in infraclusion. After five months' treatment the parent found it necessary to leave the city for a period of one year. I did not advise treatment during the absence because I believe nature through normal development may correct the remaining variance; if not, only a brief period of treatment should be necessary.

This case was particularly interesting because of the two supernumerary teeth involved and the pronounced malposition of the normal central incisor.

CASE 4.—Patient, thirteen years of age. Case was one of distoclusion, Class II.

The family history was favorable.

The patient at presentation had enlarged and infected tonsils, and adenoids. These were removed by his physician before orthodontic treatment was started. The patient was a mouth breather, due to the tonsils and adenoids.



The mandibular posterior teeth were distal in their relation to the maxillary posterior teeth the width of one premolar.

The mandibular anterior teeth in their relation right to left were fan-shaped. The maxillary central incisors were fractured half their length incisogingivally. The pulps of these teeth were extirpated and the root canals properly filled. The missing structure was properly restored by operative means. Operative work done by family dentist.

Fig. 13 shows model (left) of the case before treatment, and articulation after treatment.

Fig. 14 shows right side view of the case before and after treatment.

The models in Fig. 15 show the left side view of the case before and after treatment.

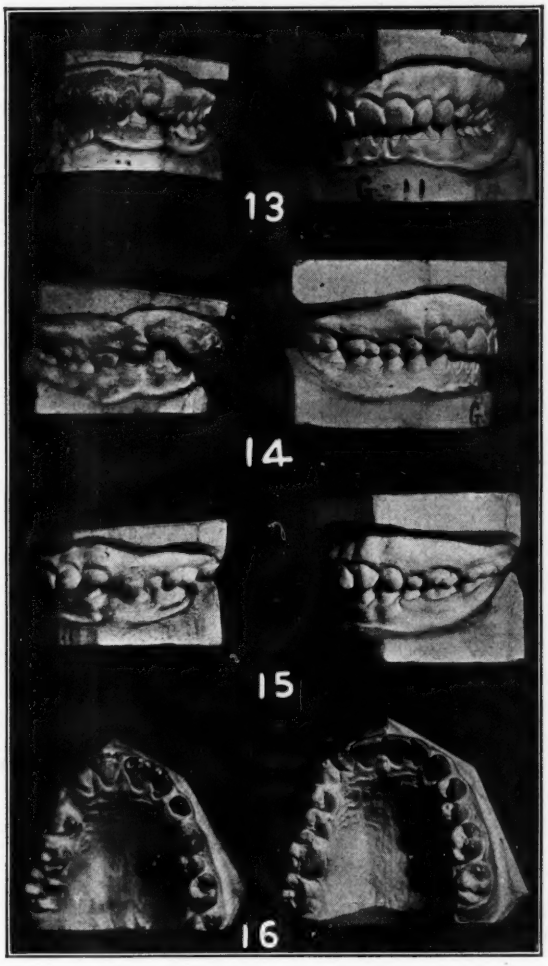
Fig. 16 shows the occlusal view of the maxillary teeth before and after treatment.

The case was under treatment for two years and ten months. X-ray pictures were taken at intervals during the treatment to note any change in the

maxillary central incisors. No pathologic condition was manifest, and to my knowledge the case as treated and shown is still favorable.

This case was particularly interesting because of the danger (as I visualized it) of working with devitalized teeth, and because of the pronounced change in facial symmetry as a result of orthodontic treatment.

Another factor of interest was the abnormal relation of the mandibular anterior teeth; they greatly approximated the soft tissue lingual to the maxillary anterior teeth.



Combined lingual and labial appliances with intermaxillary elastics were used in the treatment.

Appointments were made at intervals of three and four weeks. And the appliances were adjusted as needed as the case progressed.

CASE 5.—Patient was seventeen years of age. Malocclusion classed as distoclusion, Class II.

The family history was favorable.

When the patient presented for treatment, his tonsils were badly infected and he had adenoids. Patient was a pronounced mouth breather. The tonsils and adenoids were removed before treatment was begun.

The mandibular teeth were in distal relation to the maxillary teeth. The only teeth in occlusion were the first and second molars. The second molars in their occlusion were more normal than the first molars. It would appear from the illustrations of the case before treatment that the relation in occlusion has been exaggerated; this, however, is not true because the relation shown is an exact duplication by measurement, and is in accordance with clinical findings.

The protrusion of the maxillary anterior teeth was very pronounced, and the chin gave the appearance of underdevelopment. The facial symmetry was greatly disturbed. The patient was very self-conscious and sensitive to the condition.

Fig. 17 (left) shows model of the case before treatment. Note lack of occlusion of all teeth to the first molars with accompanying protrusion of maxillary anterior teeth. The model at the right shows the favorable change in the relation of the maxillary and mandibular anterior and posterior teeth, with reduced protrusion and correction of the open-bite.

Fig. 18 shows occlusal views of the maxillary teeth before and after treatment. Note in the left view (before treatment) that the second premolars are

missing; these were extracted at a previous date because of infection. The model at the right shows favorable change with increased symmetry.

Fig. 19 shows left views of the case before and after treatment. The model at the right shows better relation of all the maxillary and mandibular teeth and also shows that the spaces left as a result of the extraction of the second premolars were closed.

In Fig. 20 right views of the case before and after treatment show the change in relation. In this photograph in the models at the right (after treatment) note the missing mandibular right first premolar. X-ray pictures taken before orthodontic treatment was started showed periapical abscess, and extraction was advised.

The case was under treatment for a period of two years and four months. This case was particularly interesting first because the only teeth in occlusion were the first and second molars. I felt that orthodontic treatment would better enable the patient to masticate food properly and would aid materially in his esthetic appearance. Second, the case was interesting because if orthodontic treatment accomplished favorable results, orthodontia would be given the credit in this instance by a few medical men, because the patient's physician had advised surgical treatment (a double resection of the mandible with a possible operation of the maxilla if the former operation were not entirely satisfactory).

I cannot understand how a surgical operation of any kind would help a malocclusion with an associated facial disturbance so pronounced as this. Physicians are often too willing to use drastic means in treatment, and are unwilling to recognize their own limitations and to consult with the dentist, who in many instances can be helpful.

A combined lingual and labial appliance with intermaxillary elastics was used in this case. Appointments were made on the average of every four weeks.

All records of these five case reports are on file and are open to inspection at any time.

RADIOGRAPHIC EXAMINATION OF GOLD ALLOYS*

By John S. Shell, B.S., San Francisco, Calif.

X-RAYS have a tendency to pass through matter of all kinds, although some elements are much more opaque to such radiations than others. The amount of penetration depends upon the atomic number of the material and the number of atoms in the section through which the radiation must pass. Consequently, the absorption is proportional to some mathematical function of the thickness and density of the material as well as its chemical composition. Gold, silver and mercury have high densities and atomic numbers when compared with the elements found in teeth, bone or organic tissue, and radiographs taken through such material indicate that the metals are entirely opaque. This is not strictly true although the intensity of the radiation of a dental x-ray after passing through an inlay or amalgam is negligible compared to that which passes through the same thickness of tooth or bone.

Increasing the voltage across an x-ray tube causes a general decrease in the wave length of the radiation and increases the penetration of the rays. By increasing the voltage and lengthening the exposure the intensity of rays passing through thin sections of gold is sufficient to produce a radiograph. Pits or flaws have a much lower absorption coefficient for the radiation, and more energy passes through the sections containing the imperfection. Radiographs of such a section should show a dark portion on the developed film corresponding to the shape and magnitude of the flaw.

Fortunately, two factors inherent in dental restoration facilitate the use of x-ray for the preparation of radiographs. Although the absorption of gold and platinum is almost as great as that of lead, the thickness of most dental restorations favorable to such examinations is less than 1 mm. Second, the alloys used for heavy castings, such as heavy bars, usually contain a high percentage of copper and silver which have a lower absorption coefficient than gold. The gold platinum alloy used in orthodontic wire is one of the most opaque materials encountered in dental alloys, but the small thickness of such appliances reduces the total absorption. Soldered joints are more readily radiographed than most cast or wrought alloys, as the copper and zinc which are added to reduce the melting range have small absorption coefficients compared to gold or platinum. Flaws found in high carat inlay castings are seldom detrimental unless they occur on or near the surface, eliminating any necessity for x-ray examination.

At certain definite wave lengths† the absorption coefficient of elements changes abruptly, and an increase in voltage may decrease the intensity of the transmitted radiation. Without discussing this more in detail, it is theo-

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†The K absorption limits for gold and platinum are critical points in investigations of alloys containing these metals.

retically advisable to use radiations with a wave length only slightly longer than these absorption limits to obtain maximum penetration and reduce time necessary for a correct exposure. The maximum exposure time allowed for any dental restoration has been twenty minutes, using about 85,000 volts and five millamps. By using 210,000 volts and thirty millamps, a radiograph of the same specimen was obtained in fifteen seconds.

Microscopic pits in gold alloy castings or soldered joints are extremely difficult to avoid, using the customary dental technics, and many castings containing such flaws seem to function in a satisfactory manner for limited

Fig. 1.—Stereopticon radiographs of two soldered joints. (This reproduction is prepared for viewing with a stereoscope.)

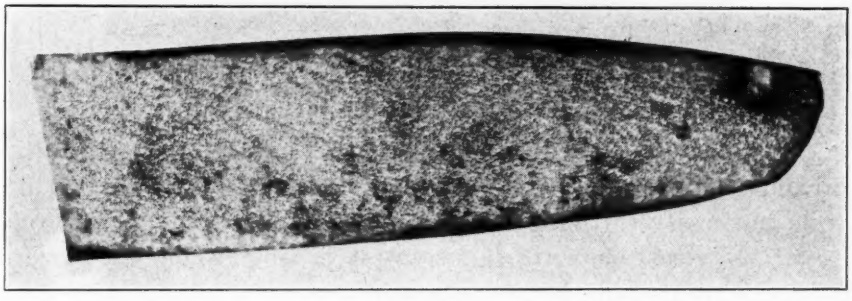

Fig. 2.—Photomicrograph of section through soldered joint. (x 30.)

periods of time. Large internal flaws, visible in a fractured section, may cause the restoration to fail in a short time, and the practitioner is often held responsible for such accidents. If such a flaw were known to be present in a clasp, it might be remedied by removing the clasp and soldering another in its place before completion of the case. Such a procedure would be relatively inexpensive. Macroscopic pits are readily shown in radiographs regardless of their location in the section of metal, and pictures obtained by passing x-rays through vital sections of a restoration, such as the clasps, bars and soldered joints, indicate the internal condition of the alloy.

The location of pits in the interior of the metal can be determined by preparing a stereopticon view, using two exposures of the same section taken

from different angles. By viewing these pictures through a stereoscope, the sensation of depth is obtained and the pits may appear beneath the surface of the metal section. Surface pits, if they are not extensive, can be removed by grinding and soldering. Deeper flaws may necessitate the removal of a portion of the restoration and subsequent casting and soldering. Either of these procedures may be preferable to delivering the completed case with the flaws intact. Oxide inclusions, gas occlusions and shrinkage cavities are the most prevalent types of flaws found in castings, and all show the customary dark regions in the radiograph. Surface pits are often caused by detached particles of investment lodged within the mold during casting.

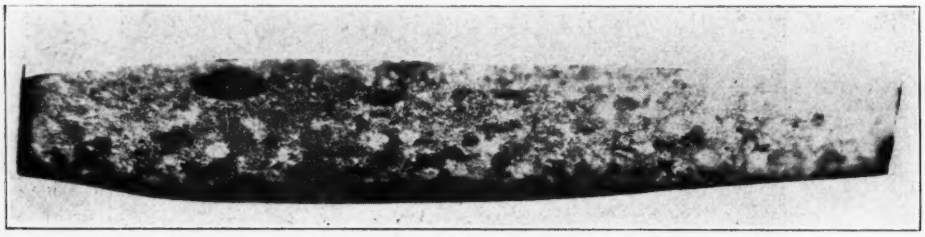

Fig. 3.—Photomicrograph of section through soldered joint. (x 30.)

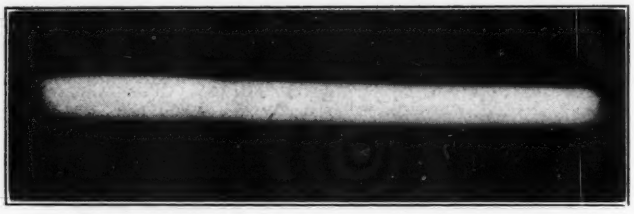

Fig. 4.—Radiograph of flat casting 1 mm. thick.

Fig. 1* shows two radiographic views of two soldered joints prepared for stereopticon examination. Each joint shows a considerable amount of pitting which was purposely introduced by overheating the solder. The solder was flowed over the space showing the greatest pitting. The joints were subsequently sectioned and the larger pits were located both visually and by obtaining photomicrographs at low magnification.

Fig. 2 shows a section of the shorter specimen through the joint at the position of the large pit shown in the radiograph. The pit is shown in the photomicrograph near the end of the section and could be seen on the surface of the metal although it appeared much smaller before the section was made. Both the radiograph and the photomicrograph show its location and extent. A large number of adjacent pits are shown in the radiograph which are not included in the section shown by the photomicrograph. Fig. 3 is a section of the longer joint showing the elongated pits completely covered by the surface metal. The external surface of this joint would have passed casual inspection as it showed no indication of surface flaws.

*The radiographs were prepared by Mr. Donald McCormack, using the equipment of the McCormack Radiographic Laboratories, San Francisco.

Fig. 4 shows a radiograph of a flat casting about 1 mm. thick. The marking was placed in the wax before casting. The sprue end (left) shows many small pits and the larger ones were easily located after sectioning. From a surface examination the casting appeared almost perfect.

Fig. 5 shows the assembled radiographs of a large casting with soldered clasps. The flaw in the occlusal rest is unusual and may be a shrinkage cavity caused by improper sprueing or casting. This restoration is now in use, and it has not been thought advisable to section the case for further investigation as the faulty rest is not subject to great stress. A few small pits can be located in the cast portion of the restoration. The picture of the clasp shown at the

Fig. 5.—Assembled radiographs of unit casting. (Note dark line through occlusal rest in second section from left.)

Fig. 6.—Radiograph of 0.075 cm. (0.030 in.) orthodontia wire with soldered attachments.

left indicates no flaws, the dark portion near the rest being caused by the thinner metal section through which the radiation passed.

Fig. 6 shows an 0.075 cm. (0.030 in.) orthodontic wire with soldered attachments. The soldered joint is about 0.1 cm. thick. The radiograph is under exposed, but there is no indication of flaws either in the wire or the joints.

Radiography provides a rapid, nondestructible method for insuring a restoration against failure due to faulty casting or soldering technic. The use of high voltage x-ray equipment or gamma rays will undoubtedly reduce the maximum exposure time to a few minutes, making such examinations practical as a routine procedure in dental practice.

HOLDING INSTRUMENT FOR THE SOLDERING OF LINGUAL TUBES*

By Walter H. Ellis, D.D.S., Buffalo, N. Y.

THE technic for soldering the lingual tubes for the reception of the one piece lingual arch, embodying the use of a new instrument is here presented. It is given as an adjunct to the clinic upon this arch presented before the American Society of Orthodontists in April, 1931.[1]

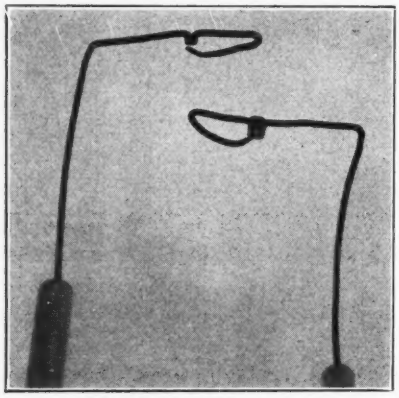

Fig. 1.

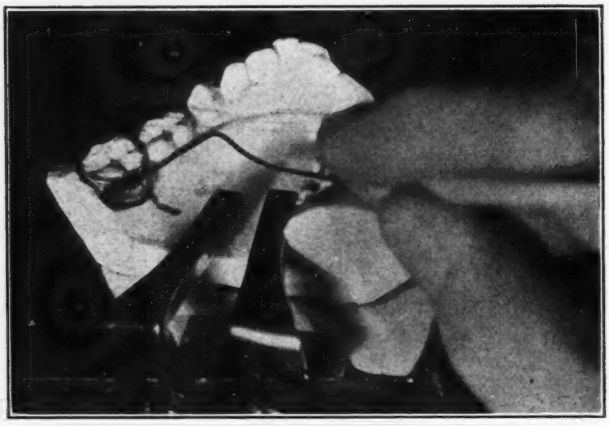

Fig. 2.

This device can be used to advantage in any lingual tube soldering operation performed upon a model. It is constructed of 0.035 nickel-silver wire, bent as illustrated in Fig. 1.

There are two of these instruments, a right and a left. They are easily constructed by bending the wire as indicated. The loop is one-tenth of an inch long, and polished to slip easily into the lingual tubes.

*Presented before the New York Society of Orthodontists, November 11, 1931.

The molar bands are fitted by either the direct or the indirect method and assembled on a stone model. Coat the inner surface of the lingual tube with anti-flux, and mount it on the soldering instrument. The tube slips over its loop and is held in place by the recurved wire engaging its gingival end. Flow 14K solder upon the surface of the tube that will engage the band.

Clamp the model upon the Bach soldering block and hold the tube in position for soldering at location, as marked on the model holding the soldering instrument with one hand and the blow pipe with the other hand, Fig. 2.

The wire of the soldering instrument, extending mesially and distally as it emerges from the recessed tube, occupies the same position as will the arch when it is seated into place. Therefore it indicates exactly the alignment of the arch side arm and guides the eye in soldering the tubes at the correct location and obviates any unexpected tube rotation. In free hand soldering of tubes it is frequently difficult to obtain correct alignment of tubes as related to the completed arch.

REFERENCE

1. Ellis, Walter H.: A One Piece Lingual Arch Embodying a New Principle in Construction and Fixation, INTERNAT. J. ORTHOD. ORAL SURG. & RADIOG. 17: 766, 1931.

GAS

By Fred Morrison, D.D.S., Kokomo, Ind.

THE initial cost of equipment alone makes the general practitioner of dentistry shun the use of N_2O and O. Furthermore, his training in the administration of a general anesthetic is void of real practical experience. There is not a dental school to my knowledge in the United States that permits students to administer a general anesthetic for extractions and in surgery even under supervision, except in postgraduate classes. The clinical experience consists of a "layman's view" of members of the faculty doing the operating. It seldom creates an atmosphere to encourage the use of N_2O and O in the office.

The public has been informed of the dangers, complications and disagreeableness of N_2O and O since the introduction of procain, but never a word of praise is given unless the patient cannot be operated without the aid of a general anesthetic.

Did you ever have a little child come into the office for his first visit to the dentist, climb manfully into the chair, with a tooth that has been aching all night, to be "jabbed" with a needle and ruined for life as far as he can assimilate the idea of painless dentistry? If he has any horror of N_2O and O, he will not associate it with the rest of his dental work.

N_2O and O is indicated for cavity preparation in small cervical and occlusal cavities. Many patients prefer N_2O and O anesthesia to procain for a long period. It is not necessary to have so deep an anesthesia for cavity preparation as for extractions and surgery. Light analgesia is the ideal. The time in recovery is not so great as that spent in waiting for a local or block anesthesia to take effect. One must give a patient sufficient time to recover in the chair or retiring room following prolonged surgical anesthesia.

N_2O and O is not indicated for preparation of jacket crowns and large fillings; nevertheless it can be used successfully, but one should have the patient prepared to take an anesthetic, or the office may be "mussed" depending upon the amount of food he has eaten a few hours before. No breakfast for the morning appointment, no lunch for the afternoon appointment, is all that is necessary, except for the very nervous patient, then a small dose of a sedative may be given, which is also beneficial with procain.

Simple extractions are successfully accomplished in five minutes from the time the patient enters the chair until he leaves. A better blood clot forms, and the patient has a more normal local reaction than when procain with adrenalin is used, at least it is minus the trauma from the needle.

Anesthesia with N_2O and O may be continued safely and successfully for an hour or longer if necessary. One does not need to worry about the mental reaction a patient may have if a tooth breaks and it is necessary to use a mallet and chisel. A competent assistant can keep the field of operation clear with

sponges and suction pump to draw up the fluids from the floor of the mouth. A course in the administration of anesthesia is necessary for the dentist until he can give an anesthetic properly, so that the patient will not be "four miles under and four miles out" every three minutes. A smooth easy anesthetic means a smooth easy operation whether it be for an extraction, in surgery or for a cavity preparation.

The small frail patient does not use so much N_2O and O as the large husky patient who is full of "vim, vigor and vitality," for the simple reason that there is less space to cover, nor will he require so much oxygen to bring him back to normal when the operation is finished.

N_2O and O anesthesia has been used successfully since 1844, novocain since 1905. I do not claim that all patients react the same under "gas" anesthesia or that the operations are all so pleasant for the operator, but the same is true with the local or block anesthesia. I have seen patients react so disagreeably from an injection that the operation has been delayed from five minutes to an indefinite time, at least the appointment has been postponed.

Many patients relate the trouble they have had following local or block anesthesia before the operator could proceed. One is often told of a prolonged anesthesia of the lower lip following an extraction, probably caused by injecting into the nerve trunk. It must be disagreeable and annoying to say the least. But very few patients are informed of it before their dentist starts the injection. I have had patients inform me that they would rather have their teeth removed without any anesthetic until I tell them that it can be done successfully and painlessly with N_2O and O. It is hard to conceive of a dentist being so barbarous or narrow-minded as to extract a sore, aching, abscessed tooth just because the patient has spent a few sleepless nights and is willing to endure the pain and shock in hope that relief is near.

I believe that 90 per cent of the work that the dentist is called upon to do can be successfully accomplished with either local or block anesthesia. But I also believe and know from experience that 75 per cent of the work he does could be better accomplished with the aid of N_2O and O.

In conclusion I wish to suggest that those dentists who do not know the advantages of and indications for N_2O and O should become more familiar with this anesthetic, in order that they may be able to inform their prospective patients of its uses and benefits, along with their alibis for not administering it.

It is not necessary to make a hoodoo of an anesthetic as valuable as N_2O and O in order to use local or block anesthesia successfully.

TEACHING PROBLEMS IN ORTHODONTIC EDUCATION*

EDUCATIONAL institutions and aims have varied to a marked degree from age to age and, like most human enterprises and ambitions, have alternately served and hindered social progress. In our day, educational ideals are yielding rather generously to our fluctuating concepts of underlying principles, due to the rapid progress of science.

Dental education, like all education, is not an exact science but a complicated process which may be better understood if we apply scientific analysis to its many problems. Undoubtedly, many look upon dentistry as an empiric art, as a vocation presuming professional position, but the countless difficulties offered by diseases and anomalies of the mouth and teeth at least justify our efforts to merit scientific status. Comprehensive understanding of the basic training for such professional pursuits as medicine and dentistry is a comparatively recent accomplishment. Starting as independent educational institutions less than a century ago, dental schools are rapidly following the schools of medicine in merging with universities. The early endeavors of these colleges developed dissimilar kinds of educational plans, not unlike the medical schools of the period, which Abraham Flexner[1] classified into three types: (1) the clinical, with its simple and single object of training doctors by practical methods; (2) the university type, with equal emphasis on research and culture as well as teaching; (3) the proprietary type, with its teaching in terms of cash and its goal—a profitable business.

All statistics reveal a widespread prevalence of oral disease, mutilations and deformities. The peril of these to the health and well-being of man, to the growth and development of children, is generally acknowledged. Good dental service is, therefore, invaluable to mankind, is gaining in public favor and is more freely accepted as an essential part of every health program. The division of dentistry into several specialties has contributed materially to its proficiency, and the excellence of the standards set up for numerous dental operations has won general approval. Perfecting these modes of procedure and providing adequate training to undergraduates in general dentistry, have demanded most of the available abilities and resources. Little wonder, then, that orthodontic training has made such slow progress; the time allotted to its teaching in the usual dental curriculum (as we pointed out last year) does not permit of more than a very superficial acquaintance with the main purpose of orthodontics: the prevention and correction of dentofacial deformities.

An increasing number of parents are astonished over the dental and orthodontic services which their children need, parent-teacher associations are craving safe dental information everywhere, and the recent White House Conference on Child Welfare not only gathered a mass of valuable data, but

*Second annual report of the Committee on Orthodontic Education, of the American Society of Orthodontists, St. Louis, 1931.

focused the nation's attention on all matters pertaining to the health and development of children. According to William M. Stewart, director of the United States census, one-third of our population, or 41,000,000, are children under sixteen years of age. Fully 75 per cent of these children require general dental care and not less than 50 per cent (over 20,000,000 children) have dental anomalies which should receive orthodontic treatment.

Furthermore, it is entirely fair to say that in all matters pertaining to this orthodontic problem, general dental organizations are drifting along in an attitude of indifference, orthodontic groups have centered their activities on technical topics and disputes, and educational authorities fail to perceive the urgency of the subject or lack the means and facilities for its adjustment. These facts, of course, are well known, but we mention them to reveal the hugeness of our problem, to dispel any tendency to indifference on our part and to arouse ourselves to a realization of our responsibilities.

We are not unmindful of the tedious journey immediately ahead for our educational endeavor, nor forgetful of the recent past with its short courses oblivious to preliminary training, with its imperfect curricula, meager facilities and plentitude of dogmatic didactic lectures. Nevertheless, we return to our task in a sincere and hopeful mood.

CLASSROOM INSTRUCTION

Classroom instruction constitutes one of several methods used for imparting knowledge to students. In many orthodontic courses it has been the principal means employed, yet rarely approached the ideal implied in Flexner's definition of a didactic lecture, viz., "a textbook plus a personality." In all classes there are some students "to whom the printed page conveys relatively little, who may obtain more vivid impressions if the teacher—the more forceful and magnetic, the better—has previously lent to the statement of fact or principle the magic of personality."

The didactic lecture has, undoubtedly, been greatly overworked in orthodontic education, because the student's ability to assimilate from such a presentation is always limited, and very few teachers who employ the method possess the necessary qualifications. This form of instruction should be decreased in quantity and improved in quality, and universities should encourage the training of better teachers. With the admission of dental schools into many of our larger universities the status of full-time teachers will doubtless be greatly improved, and their teaching rescued from the allurements of private practice, in which most of them are still engaged.

Clinical lectures can be used very effectively to a small class, if they are carefully planned in advance, but are seldom employed in dental-orthodontic education because many colleges lack the facilities and teachers the time and training.

Assigned readings constitute a very valuable way of acquiring information, and orthodontic students should be urged to read systematically and to keep an organized record of such reading. Classified lists of appropriate readings from textbooks, monographs, journals, pamphlets and society proceedings should be prepared. Case reports should constitute a valuable source

for reading lists, but in orthodontic literature these are usually sadly defective, which increases a teacher's difficulties.

The seminar is a worthy form of classroom instruction and lends itself admirably to the advanced and graduate work of the relatively small groups of orthodontic scholars. Under the guidance of capable teachers, students may, by this method, acquire far more information than by mere reading alone. The prepared discussions of the seminar more vividly emphasize the significant deviations in the arguments of the topics assigned and permit of more stimulating participation.

The history of orthodontics is of sufficient importance to warrant comprehensive treatment in orthodontic education, few subjects are more suitable for classroom presentation, and the late development of the art renders source literature readily available. But the teacher offering such a course should approach his theme in the admirable manner of the historian; his enthusiasm or antagonism for certain recent modes of practice should be restrained, and the evolution of the art and science should not be traced in simple, chronologic order. Surveyed from the perspective of the philosophy of history, the subject matter divides itself quite logically, and the significance of events may thus be evaluated adequately.

Division	Class	Semester
Title for course:		
No.	Title of Lecture	
1.		
2.		
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16.		
Name of School:		
Date	Teacher	

The committee is eager to procure lists of lecture courses prepared by numerous teachers of the various subjects; hence we include an outline of sixteen periods (one semester) to be filled in by them and mailed to us for analysis and future guidance. We believe this would be helpful to us in suggesting curricula in a future report, and aid us in checking the duplications which are liable to occur.

LABORATORY INSTRUCTION

Laboratory courses have always been regarded with great favor in dental education. Training in orthodontic technology began in the department of mechanical (prosthetic) dentistry, when the treatment of dental anomalies

was comprehended entirely as a mechanical problem. During this period the treatment of one, or more, cases of oral deformity constituted the orthodontic clinical requirements of a senior dental student and laboratory manufacture of the necessary appliances was an acceptable fulfillment of the technical prerequisites. Notwithstanding the admirable progress achieved during the last thirty years in orthodontic technic, many teachers believe that laboratory courses in this division should only be offered to graduate students. The sound accomplishments of orthodontic technology, which would undoubtedly be applicable in the field of general dentistry, are thus quite generally disregarded.

Well balanced laboratory courses free from freakish details and unrelated exercises should be our objective, but during the last score of years we seem to have vacillated between ineffectual and confused courses on the one hand, and extremely abbreviated and inadequate procedures on the other. For students preparing for the practice of general dentistry a minimum requirement should be set up; for students electing orthodontics as a major, extensive courses can be planned and arranged in proper sequence. Graduate courses for the training of specialists and special courses in any one of the several divisions of orthodontic methodology (e.g., clinical photography, differential diagnosis of dental anomalies, orthodontic therapy, etc.) present opportunities and problems of a specific nature.

In orthodontic education laboratory instruction is usually restricted to the technical phases of appliance design and construction, to which we referred briefly above; but with the extension of our knowledge concerning the causes, differential diagnosis, prognosis and treatment of dentofacial deformities, new possibilities are opened up and laboratory courses in the basic medical sciences of biology, embryology and anatomy, physiology and pathology, of the related fields of metallurgy and mechanics, anthropometry and biometry, might readily be adapted and enlarged.

In directing attention to such opportunities, mention may be made of the adequate training now usually offered in dental anatomy and tooth morphology in dental schools, yet all practitioners must acquire their comprehension of the relations and functional significance of the parts of a human denture, and of the denture as an organ, by subsequent clinical observation. We know of no textbook or courses of instruction on this important theme at the present time.

The committee would appreciate assistance from teachers of laboratory courses and solicits their cooperation. By mailing us outlines of their schedules of exercises, rules and regulations, data would be accumulated which will be helpful to the cause of orthodontic education.

CLINICAL INSTRUCTION

Clinical instruction in orthodontics presents perplexing problems to faculties of dental schools, if the final results obtained for patients are fulfilled in a conscientious manner. Failure to observe this fundamental responsibility encourages a false and harmful attitude of the student toward his future patients. Rightly conceived, clinics are the research laboratories of clinicians;

they should be conducted in a scientific spirit and all clinical problems should be investigated critically.

Although the supply of clinical patients is frequently abundant in the large, general dental clinics, a more precise plan than the customary easy assignment of patients in alphabetical order is demanded. In this connection, we wish to emphasize distinctly the fact that treatments of dentofacial deformities are rarely concluded speedily and that clinical patients usually remain long after students have graduated. This unavoidable liability demands a capable staff in every clinic to carry on the unfinished cases. Various additional methods of teaching the clinical phases should, therefore, be considered and developed.

Clinical lectures, to which we have already referred, can be extended into systematic clinical demonstrations for the study of particular kinds of anomalies, the entire treatment and control of which are administered and permanently recorded by the teaching staff. In other words, demonstrations by professors and associates on specially selected groups of cases, systematically collected and prepared for exposition of fundamental principles of orthodontic therapy, offer splendid opportunities for effective teaching.

The surgical correction of extreme deformities of the jaws, which should precede orthodontic adjustment of their malocclusions, is recognized as a logical and necessary mode of procedure. While the incidence of such extreme malformations is not definitely established, they occur constantly and some of them find their way into clinics. The relations between surgical and orthodontic divisions of a clinic should, therefore, be so intimate and proficient that the teaching opportunities of those fundamental dependencies can be utilized for the benefit of the classes in attendance. Such effective organization also strengthens the student's confidence in orthodontic diagnoses and emphasizes the limitations of orthodontic therapy.

Orthodontists are disposed to deride dentists for permitting laboratories to deceive them with alluring advertisements about orthodontic appliances. The present status of this situation is indefensible and abominable, but offers an exceptional opportunity to clinics to proffer scientific service in the diagnosis and prognosis of oral deformities.

It is difficult to estimate the scientific value of an orthodontic clinic because very few have thus far achieved any scientific rank. Most clinics stress the "practical" side of their service, that is, the rapidity with which their participants acquire deftness of technic. Very few have become centers of research, or accumulated and indexed data of scientific importance. To achieve distinction in this field requires careful planning, adequate facilities and a capable staff.

The recording, indexing and compiling of clinical data deserve particular attention and care in a teaching clinic. If the essential items of complete case histories are recorded in a methodical manner and rendered available, students are more likely to adopt a similar plan in their future practices. Definite problems (which can only be answered by referring to the clinic's records) can be assigned and fixed periods of time can be allotted to each student for assistance in the records room, to provide ample opportunity for acquiring

direct knowledge of the subject. "The smallest group of facts, if properly classified and logically dealt with, will form a stone which has its proper place in the great building of knowledge, wholly independent of the individual workman who has shaped it. And this great structure, the proportions of which are beyond the ken of any individual man, possesses a symmetry and unity of its own, notwithstanding its haphazard mode of construction. This symmetry and unity lie in scientific method."

DIVERSITY IN COURSES

Because orthodontics was developed by dentists whose daily duties furnish excellent opportunity for hindering denture maldevelopments, it will undoubtedly remain an important branch of dentistry. It is reasonable to assume, therefore, that orthodontists hereafter will come from the ranks of the dental profession, and that all future students of dentistry should receive a definite, minimum amount of education in the principles and methods of orthodontics.

Minor undergraduate courses for dentists have not been uniform in the past, and widely divergent views concerning their content prevail to this day. In a future report on curricula we intend to offer a plan for such a brief course which we hope will promote greater accord. In the meantime, we shall value highly any constructive suggestions from teachers and experienced educators which can be applied to this aspect of our problem.

Unfortunately, dental anomalies are not restricted to children residing in large cities, where orthodontists abound. The distribution of oral deformities is comparable to that of dental caries in children, and a demand for their correction may presently be made—is being made—in all communities. Anticipation of such a circumstance has prompted the suggestion[2] that undergraduate courses in orthodontics could be considerably enlarged and offered as an optional major. Advocates of this plan assert that it would enable students who elect such a course to combine orthodontic practice with that of children's dentistry, and thus bring a much needed and better service to neglected thousands. One university is establishing such a course at present.

Graduate courses for dentists who choose to prepare themselves for the practice of orthodontics as a specialty are being offered in a number of university dental schools. Some institutions have tried to meet the demand for such instruction by offering two kinds of courses: (a) the *regular* graduate course which conforms to the usual academic demands in other departments of universities and which are made upon all candidates for advanced degrees; (b) the *limited* graduate training designed for practitioners who find it impossible to adjust their absences from practice to the university calendar for the regular courses; or who cannot meet the exacting requirements of admission to advanced standing, of minor and major courses, attendance, research, thesis, etc.; (c) intensive short courses, limited to particular subjects, are also being offered at various times during the school year in a few schools and are primarily intended to make the practitioner more proficient in certain phases of his work. In some schools these latter courses are offered only to orthodontists.

RESEARCH

While medical research did not begin in medical schools, it is considered indispensable in the teaching of medicine. Flexner[1] maintains that "modern developments . . . have resulted in a general acceptance of the principle that efficient and progressive training is procurable only where original scientific activity is in progress." Despite the numerous independent research institutes, university medical laboratories and clinics have made many notable discoveries.

The present position of research in many dental schools is unsatisfactory, although universities usually possess adequate facilities, especially in allied departments. With a capable staff and sufficient equipment for effective teaching, the conditions needed for scientific investigations are procured only in part. The dental faculty must recognize its responsibilities to advance, as well as to teach and use, dental knowledge.

The same obligations rest upon teachers of orthodontics. The rapid progress of the last thirty years has disclosed more unsolved problems than we anticipated. We have not reached finality. "Problems, therefore, abound and press on us—problems due to ignorance, problems created by knowledge. They must be studied before intelligent action can be taken. Hand to mouth contrivance does not suffice. Who is going to study them? Who and where? There will be, of course, from time to time a lonely Mendel or a lonely Darwin, who may do epoch-making things. But more and more the worker needs coworkers and facilities such as the individual is not likely to possess; he needs also soil in which to grow. However deeply the flash of genius may penetrate, the bulk of the world's work in research and teaching will be done in universities—if universities are what they ought to be."[3]

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DEPARTMENT OF
ORAL SURGERY, ORAL PATHOLOGY AND SURGICAL ORTHODONTIA

THE PRACTICE OF ORAL SURGERY*†

By Edward C. Armbrecht, D.D.S., Wheeling, West Virginia

MANY years have passed since the beginning of oral surgery as a specialty of dentistry. During this time we have found that the mouth is an important factor in the general health of the individual. It is not my purpose to relate the epoch-making steps of the past or to prophesy the wonders which may come from the future. Suffice to say, that it has taken practical men to develop the obvious procedures, as well as those who have pondered and mused over the seemingly impossible, those who have placed their flying imaginary thoughts in the hands of the practical men for trial and error, all these have contributed to the evolutionary advancements of this specialized field.

It is within the memory of the most of us, of the time when the dental profession was challenged by Hunter and Mayo to be on the alert for oral infection, not only in direct connection with the teeth but rather throughout the entire oral cavity and its associated parts. This field covers more than the extraction of teeth, for it involves all diseases and lesions found, inclusive from the uvula to the lips, from the maxillary sinus to the submaxillary triangle of the neck. The general practitioner is trained to diagnose, but seldom do we find him equipped to treat many of these oral surgical conditions. Therefore, it would seem reasonable to assume that each community may well support the specialty of oral surgery.

The success of many oral surgical operations may rest upon the aid and cooperation of any of several men: of the general practitioner of dentistry in the proper filling of a pulp canal previous to the amputation of a diseased root tip, of the orthodontist, in the use of auxiliary appliances in cleft palate cases, of the prosthodontist in recognizing the value of an alveolectomy as im-

*Read before the combined meeting of the Maryland and the West Virginia State Dental Societies at Cumberland, Md., September 14, 1931.

†Oral Service, Ohio Valley General Hospital and Wheeling Hospital.

Fig. 1.—L. J., male, aged thirty-four years. Fractures of the mandible. Malunion in fracture of two months' duration. Chief complaint was inability to masticate food and to talk satisfactorily.

Patient was injured, resulting in a comminuted fracture at the symphysis and a compound fracture within the ramus of the mandible. The fracture at the symphysis had remained in good position and healing had begun. The upper fragment of the ramus fracture was in abnormal forward and outward position..

It was thought that external aid in holding this fragment in position could be obtained. An incision was made beneath the ear and as near the line of fracture as possible. A hole was drilled through the upper fragment. A wire was passed extending out through the tissue and in the direction of a wire hook, which had previously been fixed by means of a plaster head-cap (after Ivy). This hook was then connected with the wire by a heavy rubber band.

The x-ray picture showed the fragment in better apposition.

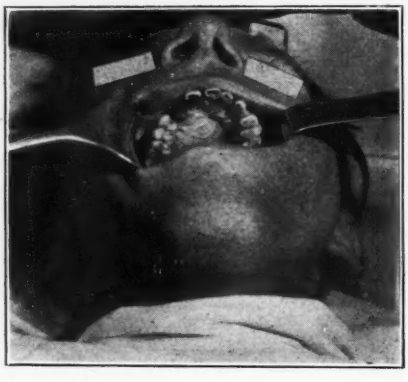

Fig. 2.—P. S., male, aged forty years. Multilocular cyst of palate. Chief complaint was marked swelling of tissue extending down from the palate and interfering with speech.

Swelling around teeth of a few years' duration had been temporarily relieved by extraction of two teeth; after which the swelling became enlarged and extended toward the palate, at which point it had been lanced several times.

The x-ray picture showed extensive bone involvement of right superior maxilla. A partial resection of upper right maxilla including the extraction of all borderline questionable teeth; thorough curettage and cauterization, iodoform packing in situ.

The cavity began to heal from the bottom up and has all indications of closing satisfactorily.

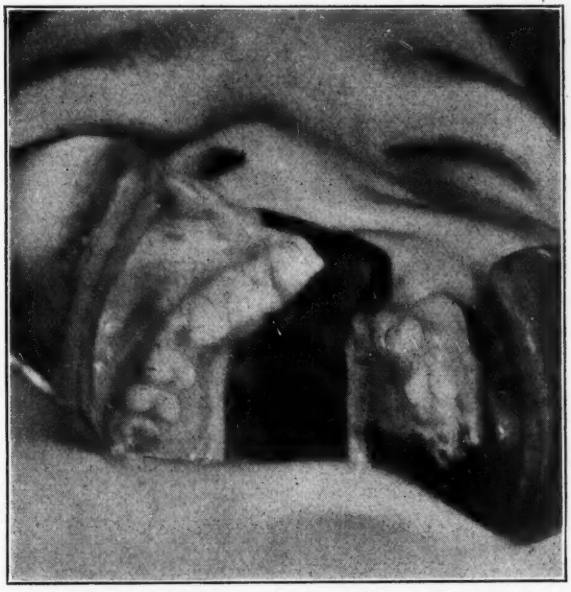

Fig. 3.—P. R., male, aged ten years. Cleft lip and cleft palate, ghastly deformity. This was a congenital deformity too long neglected by his parents.

It was found necessary to have the tonsils removed. The opening between the maxillary bones was quite large and the anterior teeth were in abnormal position. An auxiliary orthodontic appliance is being constructed and no surgery will be started until after this gap is reduced in size and these teeth are brought into as nearly a normal position as possible.

Fig. 4. Fig. 5.

Fig. 4.—Mrs. S., aged fifty-five years. Spastic torticollis. Chief complaint was inability to rotate head. This patient was referred to the oral department for appliances that would hold the head in a normal, straightforward position.

Dr. J. Schwinn, general surgeon, resected part of the sternocleidomastoid muscle, as well as part of the spinal accessory nerve, in order to relieve this spasm condition of the neck muscles. The operation was a success, but it left the patient with a weakened muscle on the left side. It was thought that an appliance might aid these muscles in returning to normal function. A plaster Barton bandage with a heavy wire in it was used on the head; while a figure-of-eight plaster bandage was used around the shoulders, which also had a wire incorporated in it. After the bandage set, a heavy rubber band was used to connect the two hooks, as shown in Fig. 5.

portant in the success of temporary dentures, and of the oral hygienist by eliminating tartar and stains before any extensive surgical procedure is started within the mouth. Many other examples might be mentioned, not only of members of the dental profession but also of our medical colleagues. From this latter standpoint any operation of a surgical nature requires recognition of certain possibilities, which if not previously ascertained may endanger the patient's life, viz., hemophilia, anemia, purpura, diabetes, nephritis, syphilis, tuberculosis, myocarditis, etc. It seems logical that close contact with the patient's physician is essential; this appears to be the only sensible and desirable way to handle such situations.

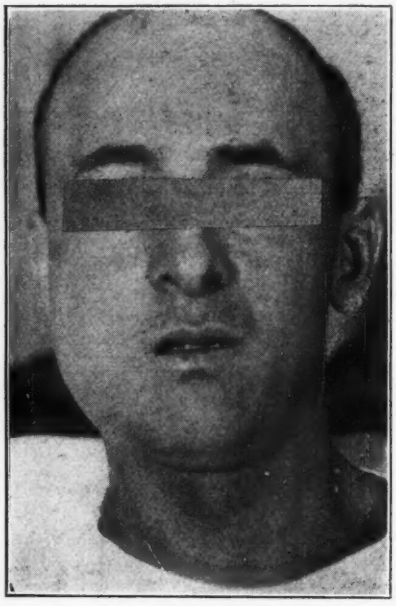

Fig. 6

Fig. 7

Fig. 6.—Mr. A., aged thirty-four years. Infected jaw. Trismus and pain in right cheek. Three weeks previously novocaine had been injected for a tuberosity area. The patient stated that anesthesia was not easily obtained, inasmuch as several attempts had to be made. The patient had marked swelling, was unable to open the mouth; had a temperature of 101 degrees, and was quite uncomfortable.

Upon incision pus was found within the masseter muscle. Under heliotherapy, maintaining drainage, supportive measures, patient had an uneventful recovery.

It is apparent that novocaine injected in the body of muscles seems to cause a certain amount of contraction as well as breaking down of the tissue, hence the infection.

Fig. 7.—A. B., female, aged six years. Ankyloglossia (tongue tie). Unable to talk plainly. From birth the child was unable to move the tongue freely. Mother complained that the child could not talk clearly.

The adhering muscular fibers connecting the tongue with the floor of the mouth were severed. This tissue was dissected and undermined freely and the ends were brought together with silk sutures.

Tongue markedly improved in function; it will take considerable time for her speech to improve if this is the only cause. She has been sent to the cleft palate speech clinic at the Ohio Valley General Hospital.

When Hunter coined the term oral sepsis, he focused the attention of the entire medical profession upon the mouth as a vital cause of the body disease. It may be enlightening to quote from him, "It must certainly be apparent to us that many systemic disorders are due wholly, or in part, to oral sepsis; that it is far more frequent than many suppose, so much so that few of mature age are free of it." A focal point of infection not only is a place of entrance for infection, but may also be a locale where the bacteria acquire certain and pe-

culiar characteristics enabling them to migrate through the blood stream and to become isolated in tissues with like characteristics. Today we find much misunderstanding among dentists, physicians, radiologists and bacteriologists whether to overemphasize or underestimate the importance of oral infection, and this seems to be the uncertain ground upon which many men of the dental and medical professions are standing. In my mind the conservative attitude toward oral sepsis, whether it be around a beautiful porcelain crown, bridge

Fig. 8.—R. H., male, aged sixty-seven years. Horizontally impacted third molar. Patient was referred by his physician for elimination of any oral pathology.

There was no complaint regarding the oral cavity. The patient's systemic condition was that of a heart involvement. X-ray study showed several infected teeth.

Because of the patient's advanced age and the severity of this impaction, we advised no operative interference, except in those teeth showing definite infection.

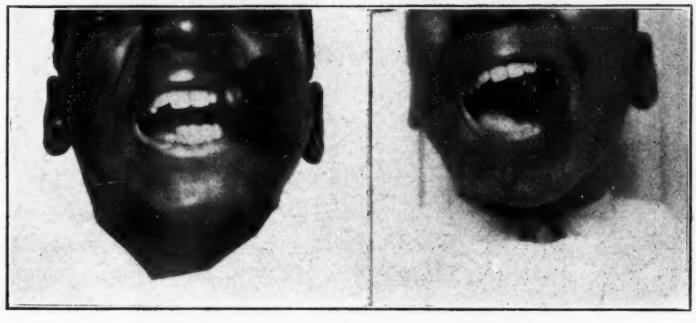

Fig. 9 Fig. 10

Fig. 9.—W. W., male, aged ten years. Ankylosis of temporomandibular joint. Chief complaint was inability to open the mouth.

Two years before patient presented himself, he was knocked down by an auto and suffered an injury to the jaw. No medical treatment was given at this time. Patient stated it had been a long time since he was able to open his mouth.

X-ray findings showed an abnormal callous formation around the old fracture. An L incision was made over the joint region; the parts exposed showed a definite union of the lower border of the zygomatic process and the malposed condyle fragment of the mandible, producing a definite bony ankylosis.

Fig 10.—Case shown in Fig. 9, after operation.

restoration or a gold inlay, is merely conserving sepsis, actually not recognizing the very fundamental principles upon which preventive medicine has been founded. The universal complaint of halitosis is quite frequently relieved wholly or in part when once the oral sepsis is removed; perhaps this enters as the causative factor more often than a faulty diet or constipation, as is commonly thought. Many conditions are missed, not because scientific knowledge is lacking,

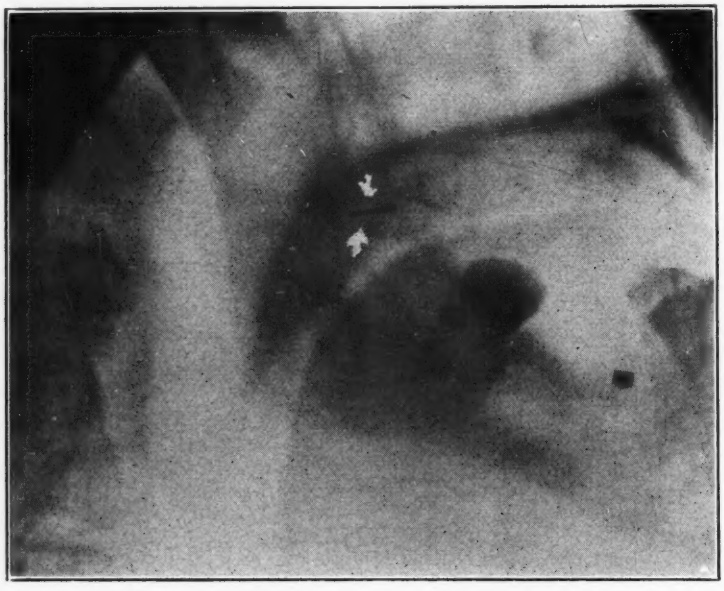

Fig. 11.—G. W., male, aged sixty-two years. Broken needle in jaw. The referring dentist said novocaine was being injected when patient jerked suddenly, resulting in the needle breaking. A piece about one-half inch in length was retained according to our x-ray findings. Under ether anesthesia an incision was made over the area of injection, and the tissue was gently retracted. After a search of about one hour needle was removed. These cases are indeed tedious ones, but in my opinion the needle should be removed as soon as possible after the accident.

Fig. 12.—A. F., male, aged fifty-three years. Residual radiculodental cyst. Chief complaint was pain and swelling beneath upper lip.

Several years before the teeth had been removed, and an artificial appliance was placed; but during the past few years the patient complained of pain and swelling in upper anterior region. An area of rarefaction about the size of a walnut was shown by x-ray study.

Fluid was obtained upon aspiration. A ridge incision was made, and the cyst wall was entirely enucleated and the cavity was cauterized. Iodoform gauze saturated with balsam of Peru was used to pack the cavity; silk sutures were used to bring the tissues together.

In order to avoid a residual cystic condition the membrane of the radiculodental cyst should be either enucleated or destroyed entirely or made to join the surface epithelium. (As stated by G. V. Boyko.)

but usually because the sense of observation has not been thoroughly trained. Ulceromembranous stomatitis (Vincent's infection) might be diagnosed by the sense of smell. To expose a patient's blood stream in the presence of these organisms may be vital to his life. It would be interesting to know some statistics as to what extent oral sepsis is a causative factor in postoperative pneumonia or in a case of lung abscess in which a general anesthetic has been administered. When we recognize that a high percentage of all body ailments originate above the clavicle, it is no wonder that such men as Hunter, Rosenow, Haden and others are forever pointing to oral sepsis as a common cause of disease.

The problem of referred patients is indeed a complex one; each community presents its own advantages and disadvantages of how the specialized practice of oral surgery may be utilized. It does seem that, generally speaking, a fundamental responsibility is that the patient should be considered first; yet this must be handled tactfully, so that the patient will return to the referring doctor. Unless a clear and concise explanation of any condition is given to the patient, misunderstandings are bound to occur in the tales carried from one doctor to another. The ability to recognize the town temperament from the country temperament in people is an important factor leading to the success in building up confidence of the profession and laity in this specialty. Innumerable occasions arise in which the consultant or operator is taxed to the very limit of his fortitude, and in many cases his position is not to be envied. A high sense of justice and fair dealing must be ever present in the oral surgeon's office.

The practice of oral surgery is without a doubt a more confining field than the general practice of either medicine or dentistry; so much so that frequently I have felt guilty of traveling, as it were, in a rut; yet there is some consolation in the borderline place it holds between the medical and the dental professions. We all have undoubtedly experienced those moments of deep reflection, behind the closed doors of our office, when we dare dream of the complexity of human ailments. The instant flash that comes to us seems to say how futile our treatment is, in this or that case; yet the humblest effort upon our part adds to the sum total of human happiness. The profession of medical science in all of its phases is one of hard work, and in the journeying not only of outstanding progress but of the everyday grind, it requires that we must not stop or hesitate for fear of being jostled about and subsequently transplanted. The idealism of our profession may not be practical to the "hard-boiled" business man, but it has been the nucleus around which all progress has been made, and as long as science exists we shall possess it. We are not dealing with commodities but rather with a finite being in an infinite world.

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77 Twelfth Avenue

RHINOPHYMA

With Report of Case*

By Matthew N. Federspiel, D.D.S., M.D., F.A.C.S., Milwaukee, Wis.
Professor of Oral Surgery, Dental and Medical Schools, Marquette University

WE MAY designate rhinophyma as a nodular, tumor-like growth of the cutaneous surface of the distal part of the nose, often preceded by acne rosacea and therefore considered as the hypertrophic stage of this skin affection.

The growth involves the lower half of the nose, especially the tip and both alae, where, under normal conditions, we find numerous and large sebaceous glands. The mass is usually multilobular, pitted, furrowed and coursed by many dilated and tortuous capillaries and small venous branches causing the tumor to be very hyperemic and bluish-red or livid in color. Occasionally minute areas of necrosis may form, probably caused by the pressure from the cystic enlargement of the sebaceous glands of some kind of local nutritional disturbance, resulting in small areas of hemorrhages.

The growth is very disfiguring and repulsive in appearance, so that the patient is reluctant to appear in public.

Various descriptive terms have been applied to the growth, such as hammer nose, whisky nose, double nose, nodular nose, and as an underlying tissue formation a cystadenoma, an adenofibroma or an acnehyperplastica was claimed.

The real, inciting cause of the deformity is still unknown. Some authors have attempted to associate this luxuriant tissue growth to the drinking of whisky, hence the term "whisky nose." This is, of course, not true, as this nasal condition was observed and found in individuals who are and were total abstainers from alcoholic liquids. Some dermatologists have claimed that rich and excessive foods and the use of strong tea and coffee were responsible for the occurrence of the growth. But this is an unfounded hypothesis. A "fatty nose" seems to be a predisposing factor.

Fuld[1] considers the pathologic changes that form the growth in these stages: first stage, a simple venous engorgement; second stage, the veins and the capillaries permanently enlarged; third stage, there is an enormous hyperplasia of the connective tissue elements of the skin, and the sebaceous glands are so enlarged that the nose presents a honeycombed and unsightly appearance.

Grattin[2] believes that because of the persistent hyperemia the vessels become permanently enlarged. A hypernutrition of the skin results. The sebaceous glands hypertrophy first as gelatinous nodules, later becoming fibrous The markedly hypertrophic forms are due to new connective tissue growth, amounting to a real hyperplasia.

Hanrahan[3] reports that the disease is a mild chronic inflammatory reaction brought about by the accumulation of large quantities of sebum in dilated and hypertrophied glands.

*Reprinted from the February, 1930, issue of The Wisconsin Medical Journal.

HISTOPATHOLOGY OF RHINOPHYMA

From a histopathologic point of view the rhinophyma is characterized by presence of hypertrophic and hyperplastic processes accompanied by inflammatory reactions or changes of the interstitial tissue.

In many instances the rhinophyma is preceded by acne rosacea stage, in which one may observe definite circulatory disturbances in the affected tissues with the appearance of cutaneous nodular formations and development of

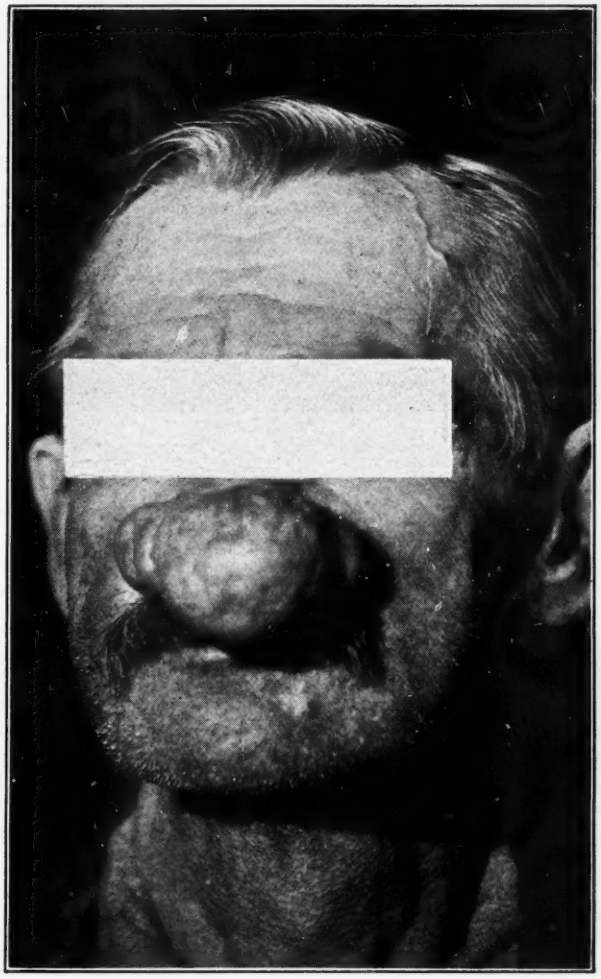

Fig. 1.—Note size of tumor covering the upper lip and in contact with the vermilion border of the lower lip.

telangiectatic areas. By some dermohistologists these changes are considered as an incipient or first stage of rhinophyma.

According to the histopathologic picture or morphologic structure we may distinguish between (1) a genuine hypertrophic or hyperplastic form and (2) a telangiectatic and fibrous type of rhinophyma.

The first mentioned type is initiated by hyperplastic and hypertrophic processes which involve chiefly the sebaceous glands and often lead to a cystic dilation of the same and their excretory ducts. There is undoubtedly a new

Fig. 3.—Right side of tumor, showing extra lobe-like formation.

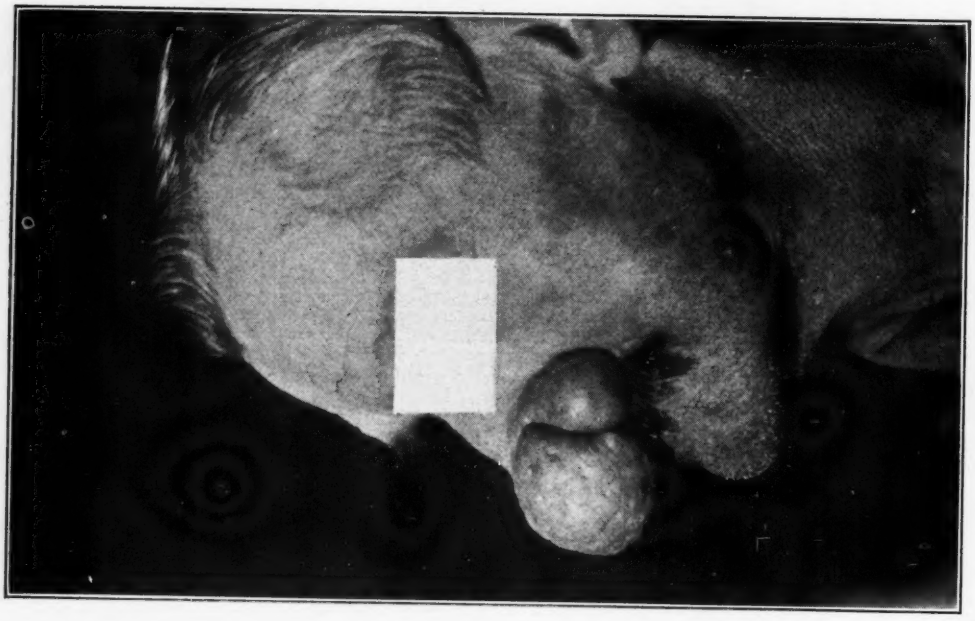

Fig. 2.—Left side of tumor, showing extra lobe-like formation.

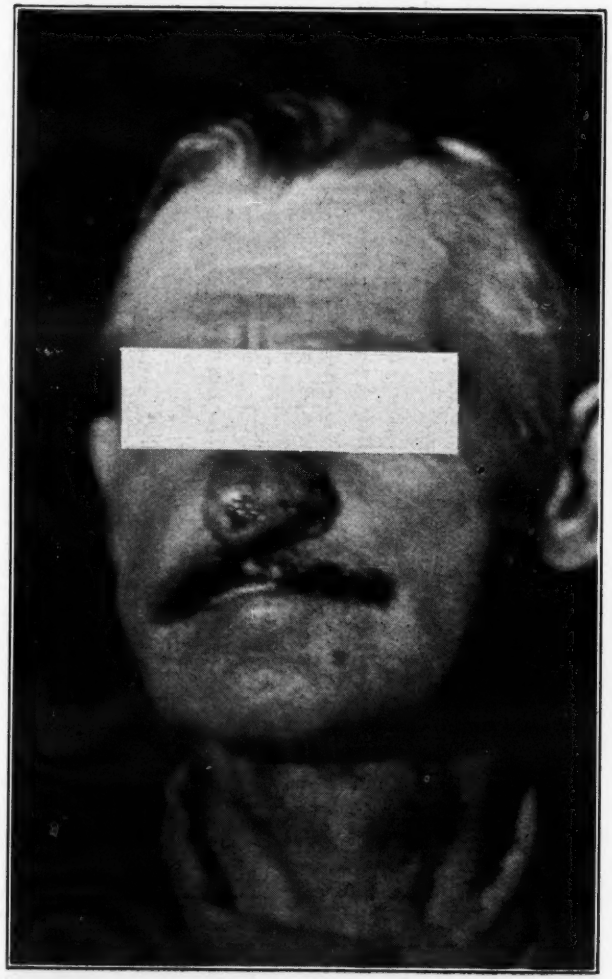

Fig. 4.—Front view, seventh day after removal of growth from nose.

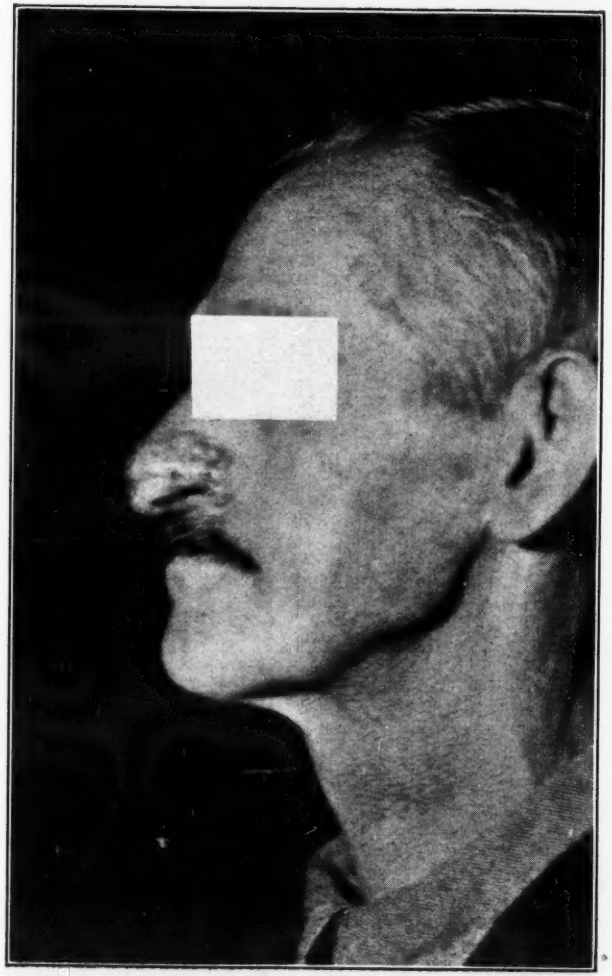

Fig. 5.—Side view, seventh day after removal of growth.

growth, a new formation of the sebaceous gland lobules, a proliferation, which greatly resembles an adenomatous formation. The excretory ducts appear funnel shaped and show hyperkeratotic processes.

The fibrous interstitial tissue is more or less increased and contains distended blood vessels, particularly dilated small vessels, thus imitating in places a cavernous tissue. This latter phenomenon—tissue varicosities and abnormal vascularity—explains the abundant hemorrhages which occur during the surgical removal of the rhinophyma. If both latter mentioned tissue processes—proliferation of fibrous tissue and vascularity—predominate, or are exaggerated, the second form or type of rhinophyma results. It is of comparatively rare occurrence.

It is not uncommon that suppurative inflammation may suddenly involve the sebaceous alveoli, due to hypersecretion and subsequent stagnation of

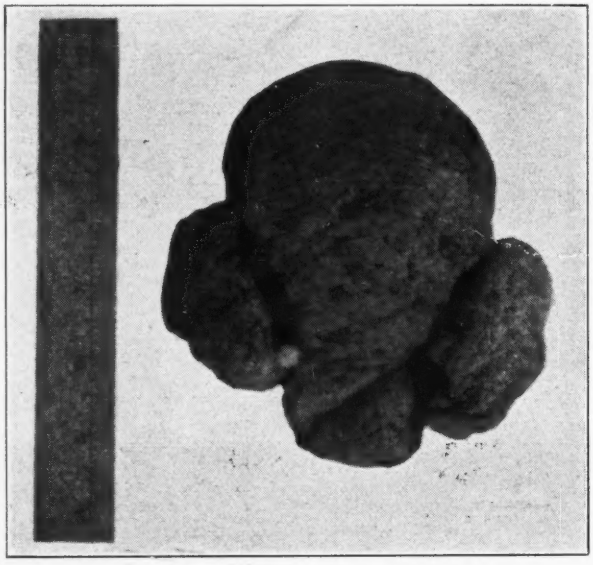

Fig. 6.—Showing specimen after removal. Note the projecting growths on each side.

the products of secretion. Inflammatory processes not only will affect the corresponding glandular units but will extend as well into the adjoining interstitial tissue; in this way miliary abscesses appear.

CASE REPORT

The following is a report of a case that I operated on at the Marquette University Hospital:

Charles K., aged sixty-two years, laborer, reported to my clinic November 1, 1928. He froze his nose five years ago. The nose began to enlarge after that and continued to grow in size. (Fig. 1.) Under ether anesthesia an incision was made over the tumor in order to obtain a flap of skin sufficient in size to be used as a covering over the raw surface after the removal of the growth.

The tumor with the remaining skin was then cut free from the underlying cartilaginous frame of the nose. The fibrous tissue in the tumor made dis-

section rather difficult. When the ducts of the glands were cut there was a thick cheesy sebaceous material oozing freely. The bleeding was very profuse but easily controlled after the mass was cut away.

On each side of the nose there was an extra lobe-like formation (Figs. 2, 3), which was removed with the large mass attached to the tip. Care was maintained to preserve the skin which joined the mucous membrane on each side of the alae. This is important in order to prevent scar formation and to hasten healing. After the removal of the mass and trimming away of any remaining part of the tumor, until the desired and natural shape of the nose was obtained, the flaps of skin which were previously preserved were placed over the raw surface and the edges trimmed to conform to the nose and to form edge to edge contact.

The healing was remarkably rapid without any complications. The patient left the hospital the seventh day after the operation. On the fourteenth day healing was complete. (Figs. 4, 5.)

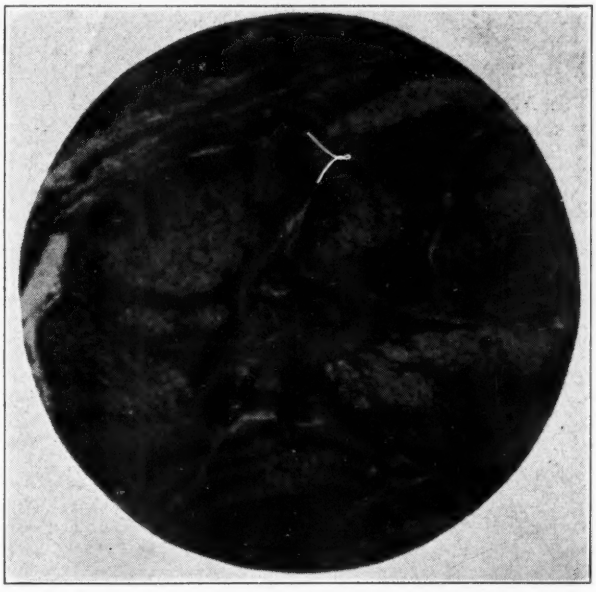

Fig. 7.—Note varying thickness of fibrous septa.

The treatment of rhinophyma is its surgical removal which, whenever necessary, should immediately be followed by rhinoplastic procedures.

Our cosmetic result in this case was an excellent one: the disfiguring effect has disappeared. Following is the pathologic report by Dr. Edward L. Miloslavich.

GROSS DESCRIPTION

Specimen consists of a pear-shaped piece of tissue with two small projecting auricles, one on each side of its narrowed portion. Externally it has a skin covering whereas the underlying aspect displays a connective tissue formation. The skin surface exhibits minute crater-like formations or depressions.

The specimen measures 64 mm. by 52 mm. by 31 mm., the thick dimension being somewhat below the central portion. The tissue throughout possesses firm consistency (Fig. 6).

MICROSCOPIC DESCRIPTION

There are numerous small and large islands consisting of somewhat large, light-stained cells, the type commonly found in sebaceous glands. These cellular islands are separated from each other by fibrous septa of varying thickness. Blood vessels in moderate abundancy can be seen traversing in these septa. Whenever the septa come together, they contain a diffuse lymphocytic infiltration. The islands stand out to a very marked degree. The protoplasmatic outlines of each cell are clearly evident; the cells are large, flat and polyhedral in shape. The cytoplasm stains lightly and displays a very delicate threadlike network or a spongy appearance. The nuclei are small, round and stain prominently. (Fig. 7.)

DIAGNOSIS

Marked hyperplasia of sebaceous glands with hypersecretion; chronic fibrous interstitial inflammatory reaction (rhinophyma).

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CASE REPORT

By George F. Seeman, D.D.S., Nashville, Tenn.

FIG. 1 is an x-ray picture showing a shadow cast over the crown and a portion of the root of the mandibular third molar.

Fig. 2 is an occlusal view showing that the shadow cast in Fig. 1 is caused by a supernumerary mandibular third molar.

Fig. 1.

Fig. 2.

These two views illustrate the advantage of the occlusal view as a check-up upon the intraoral lingual view in cases where there is doubt regarding objects and their position.

ABSTRACTS OF
CURRENT LITERATURE

NUTRITION AND PEDIATRICS

By Samuel Adams Cohen, M.D., New York City

It is the purpose of this Journal to review so far as possible the most important literature as it appears in English and foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Causation and Prevention of Congenital Heart Disease. William D. Reid. Arch. Int. Med. **48**: 5, 1931.

Reid is of the opinion that congenital heart disease may be caused by some of the same factors which produce fertility of the parents. He mentions the investigations of such authorities on embryology as Mall and also Meyer who state that maldevelopment of the embryo or "monster" (a term applied to fetuses and full-term infants in whom congenital malformations are present) is not due to germinal and hereditary causes but is produced from normal embryos, whose growth or development is arrested because of their immediate environment.

The author states that such constitutional factors as endocrinopathies, chronic intoxication, faulty diet and poor hygiene are important factors in causing infertility of both parents. That is to say, these unfavorable constitutional conditions can and do cause a defective germ plasm, and for this reason he states that the treatment or correction of some of these is often followed by fertility.

Reid, who writes from the Evans Memorial and Boston University School of Medicine, Boston, emphasizes the fact that at the end of the eighth week of fetal life not only is there normally completion of the subdivisions of the heart but also at this period of fetal development there is almost complete development of the valve apparatus, and if there is defective development of the heart (as well as other organs of the fetus) it is, according to Reid, due to some of the factors which contribute towards infertility. If there is fertility, abortion is liable to follow early in pregnancy because of the maldevelopment of the fetus.

In view of the above the prevention of congenital cardiac defects can be helped to a great extent by the prevention and correction of those factors which produce sterility of both parents.

Vitamin D Deficiency, Dental Caries and Tonsillar Enlargement. Helen M. Mackay and S. F. Rose. Lancet **221**: 5649, 1931.

In their report of the time-honored investigation of the etiology of dental caries Mackay and Rose make several pertinent comments on the relationship of vitamin D deficiency to dental caries or tonsillar enlargement. In the main,

the present investigation compared the teeth of children who had rickets with those of a control group.

As a result of their study of these children (which consisted of 46 children between the ages of six and ten years who had rickets in early life and another group of 40 children of similar ages used as a control and who for all practical purposes showed no evidence of rickets during the first few years of life), the authors state as a part of their summary and conclusions that there was hypoplasia of the permanent teeth in 22 per cent of the children who had rickets, while only one of the control cases had hypoplasia and that only to a minor degree. These results are in agreement with Mrs. Mellanby's investigation, which showed that vitamin D deficiency in young animals produces defective dental structure. Moreover, in spite of the marked difference of the incidence of hypoplasia of the permanent teeth in the two groups the amount of carious teeth seen in the rachitic group was only slightly greater than in the children who were observed as a control group. The difference is so slight that according to the authors vitamin D deficiency in early childhood cannot be held as the important factor in determining the development of caries. The amount of caries in the deciduous teeth was about the same in the rachitic group of children as in the control group.

In other words from their small series of cases Mackay and Rose hold that previous rickets was not followed by an increased incidence of dental caries.

The authors have further found that vitamin D deficiency in early childhood does not appear to have materially influenced the tendency to the development of enlarged tonsils or of enlarged cervical glands.

Skin Temperatures of Children. Fritz B. Talbot et al. Am. J. Dis. Child. **42**: 4, 1931.

Although in 1620 Sir Francis Bacon wrote "Let further inquiry be made into the different degrees of heat in different parts and limbs of the same animal," until recently surprisingly few studies have been made on the actual temperatures of the different parts of the body in spite of the fact that there has been great interest in other aspects of metabolism. This is particularly true of children's skin temperature, and for this reason the outstanding investigation of Talbot and his associates, which began in the Children's Medical Department of the Massachusetts General Hospital in 1923, is of great scientific as well as of practical importance.

Using ten subjects, the ages of whom range from a few weeks to almost twelve years, Talbot reports that in these children the skin temperature of the trunk is highest, that of the face next, and that of the extremities lowest. These findings are in accordance with those in adults.

The important question of the value of clothing was carefully studied by Talbot, who states that environmental temperature has a very definite effect on the skin temperatures of normal persons, and he feels that it would be impossible for man living under certain climatic conditions to maintain normal temperature of his body unless he provided some artificial protective covering, such as clothing. In regard to the reaction of environmental changes of tem-

perature, this investigator has scientific proof to substantiate the clinical impression that "since the heat-disseminating surface is relatively greater in proportion to mass in the arms and legs than in the trunk and head, the extremities appear to be effective safety valves, which permit elimination of heat under certain conditions and prevent its loss under others." Moreover, it is interesting to note that humidity, within the limits of room temperature, had no effect on the temperature of the skin.

This investigator also reports that at room temperatures between 64.6° F. and 82.8° F. after clothing is removed (just as when clothing is worn), the changes in the temperatures are greater over the extremities than over either the trunk or the face. Further experimentation with skin temperatures of children and its reaction to environmental factors supports Benedict's conclusion from adult investigations that "save under extreme conditions, heat production and heat loss are two essentially independent processes." A striking example of this observation is noted during exercise when the initial reaction of the body to muscular work is to cool the surface of the skin, although there is a rise in body temperature during activity. During a half hour after activity has stopped "this reaction is reversed and the temperature of the skin rises, frequently to a point much higher than the level which preceded exercise."

In regard to the effect of fever on the skin and on the body temperature, Talbot mentions the fact that some investigators ascribe the change primarily to an increase in the production of heat while others refer to it as a decrease in the heat elimination. While it is known that both these factors affect the maintenance of body temperature, Talbot's investigation, along with other investigations, has not been convincing as to which is primary or of greater importance. Talbot does state, however, that from comparatively few figures he feels that additional studies must be made before the tentative hypothesis can justifiably be used to explain that the possibility that "fever may be due mainly to inadequate elimination of heat, perhaps, in fact, to delayed transportation of heat from the interior to the surface."

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EDITORIALS

Change in Editorship

AFTER an uninterrupted editorship of seventeen years Dr. Martin Dewey has resigned from the editorial directorship of THE INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY AND RADIOGRAPHY. This is effective with the January, 1932, issue.

Since 1915, when the Journal made its first appearance, Doctor Dewey has labored earnestly to make it an instrument for the betterment of orthodontia. The present as well as the future will form its own answer as to how well he has succeeded. That excellent progress has been made during this time is apparent. How much will be made in the future is yet to be determined.

Beginning with January, 1932, Dr. H. C. Pollock, Associate Editor of the Journal since its inception, will direct its editorial policy, with the assistance of associate editors and an advisory editorial board. It is hoped that the friends

of orthodontia everywhere, as well as the subscribers to the Journal, will give Doctor Pollock and his associates their loyalty and their moral support. The Journal will endeavor to render service as good as, and if possible even better than, it has rendered in the past.

Child Conservation and the Orthodontist

IN THE child conservation movement that has been gaining so much momentum during the past two years, it seems that the dentist and the orthodontist should play a more important part. A great deal has been said and written regarding adequate dental service for children, particularly that service which pertains to general dentistry and the conservation of deciduous teeth. Not so much has been heard or done, apparently, regarding malocclusion and the influence which it exerts upon nutrition and child welfare.

At the recent White House Conference on child welfare, the gynecologist, the obstetrician, the neurologist, and the pediatrician played very active and very important parts, as they should. However, the specialty of orthodontia with its correlated branches was not represented. Orthodontists believe that it is as necessary that the child grow into manhood or womanhood with a sound denture, a good occlusion, and an efficient masticating mechanism as it is that he or she grow to adult life with perfect lungs or with kidneys functioning properly. It is all a part of the general plan of development. Physicians, educators and statesmen, as well as many others, are well aware that normal children are essential if we are to have a race of adults that is vigorous and normal. However, for the most part physicians have not as yet been brought to the important realization of the physical necessity for, and the proper care of, a well-functioning dental apparatus if proper child health is to be maintained.

Unfortunately, the treatment of malocclusion is still considered by many physicians to be in the same class, it might be said, as paintings by the old masters—something only for the cultured and wealthy. If this attitude is prevalent, and it seems reasonable to suppose that it is, it would be prudent, no doubt, to make some effort to correct this assumption. At least the orthodontist should try to change this conception. It is reasonably safe to say that not one physician in twenty-five has the slightest interest in orthodontia as a science. He may know that it exists; he may know that it has merit; but in the main he is indifferent to it unless he has a child of his own who is badly in need of this service. If this statement is doubted, enter into conversation with a group of physicians in your own city or community and find out how little interest can be aroused in the subject of orthodontia as it pertains to child welfare and child health. Even the pediatrician expresses only slight and casual interest in orthodontia, although he knows that many habitually bottle-fed babies may require orthodontic treatment if they are not to grow into manhood or womanhood with malocclusions or malformed dental arches.

The medical and the dental professions at the present time obviously have but little of scientific interest in common. They are in many instances far apart in their professional as well as social life.

There should be no antagonism between the physician and the dentist, or in fact between medical and dental schools. Dentists and orthodontists should have a place on the scientific programs of the meetings of the American Medical Association. Physicians, in like manner, should have a more conspicuous place on the scientific programs of dental meetings. Physicians have played an important rôle in the meetings of the American Society of Orthodontists during the past several years, and they have added no small mite to the scientific thought and ambitions of the orthodontic profession as a result of their appearance on these programs. The dental profession as a whole would do well to follow the precept and example established by the American Society of Orthodontists by inviting more physicians to take part in dental programs, men whose knowledge and ability would add greatly to the value of these meetings. It would seem that this would help to establish a closer cooperation between the two professions. At a recent dental meeting in one of our large cities Dr. Charles H. Mayo appeared on the program, gave a most interesting talk on the cooperation of these two professions and his idea of the coordination of the thinking of the two professions in general. He held the undivided attention of the dentists. More such eminent men should appear before the dental associations in the United States.

It is interesting, and at the same time encouraging, to note that some professional groups are endeavoring to break down the barriers between the two professions. An effort is being made to get teachers and students of both medicine and dentistry to fraternize, to mingle, to exchange opinions, and to meet upon a common ground. It is to be hoped that this spirit will grow, because it will mean a great deal to the advancement of the dental profession, and it will produce a greater orthodontic specialty. It means the expanding of the services of dentistry to mankind, and service of some kind to our fellow man is the greatest goal that can be attained. Dentistry and orthodontia should have some voice in child conservation activities. Surely it is up to organized dentistry and orthodontia to see that this recognition is given them. The science and practice of orthodontia as related to child life are becoming increasingly important. Its services are in great demand and are highly appreciated by the layman. If it is to go forward and take its rightful position in child welfare work its workers and members must direct more attention to its general merits and the accomplishments of the past and the present as well as those of the future.

The bickerings over the relative merits of mechanical devices should cease. Relations between the various orthodontic groups should be more wholesome, and efforts should be directed toward making a practical science of what is unfortunately too generally regarded, at least by the medical profession, as a high-class art.

The Academy of Pediatrics

IN JUNE, 1931, the American Academy of Pediatrics was launched. This organization intends to include, as nearly as possible, all of those physicians in the United States and Canada, who, by adequate training and proper standards

of practice, deserve to be recognized as pediatricians. As associate members it aims to include also those who, by work in allied fields, are able to give it and its members valuable aid in furthering its special objects and advancement.

"The Academy has been formed because of the obvious need of a country-wide organization of pediatricians to perform important services which have not been undertaken by any existing organization up to this time. The objects of the Academy as stated in its constitution, are as follows:

"Section 1.—The object of the Academy shall be to foster and stimulate interest in pediatrics and correlate all aspects of the work for the welfare of children which properly comes within the scope of pediatrics. The Academy shall endeavor to accomplish the following:

"(a) To establish and maintain the highest possible standards for pediatric education in medical schools and hospitals, pediatric practice and research.

"(b) To perpetuate the history and best traditions of pediatric practice and ethics.

"(c) To maintain the dignity and efficiency of pediatric practice in its relationship to public welfare.

"(d) To promote publications and encourage contributions to medical and scientific literature pertaining to pediatrics, none of which objects are for pecuniary profit."

"It plans actively to further all of these through national, regional and state committees. National and regional scientific meetings will be held. Scientific research and clinical investigation will be encouraged, and publication of worthwhile studies, monographs, etc., will be facilitated. Standards of education, hospital organization and practice will be subjects for constant study."

Dental schools, at least for the most part, have given, in the past, courses in orthodontia that were little more than a gesture—inadequate and incomplete, just as the courses given by the majority of medical schools in pediatrics were incomplete, up to a decade ago. Medical schools, however, now are well aware of the great importance of a well-planned course in pediatrics and make their plans and coordinate their curriculums accordingly.

In a like manner, dental schools are giving better and more complete courses in orthodontia. However, the dentist who was graduated five, ten, fifteen or twenty years ago still carries with him in his practice the feeling that the correction of malocclusion is more a privilege than a necessity—just as in a like manner the physicians who were graduated at a similar period have believed that every child should have measles, whooping cough, scarlet fever and mumps; that raw milk is just as safe as milk that has been pasteurized.

The American Academy of Pediatrics intends to send out disciples to talk and work for better pediatrics. They expect, through this medium, to overcome much of the indifference which has been manifested to their subject and to encourage better training and better informed men in this department of medicine. It is barely possible that the above condition existing in pediatrics may offer some suggestion to solving a similar problem which exists in orthodontia and has existed for some years. While not exactly an identical parallel to the pediatric situation, there is no doubt but that the general problem, at least, is quite similar.

It is not the intention or purpose of this article to criticize schools of dentistry and the courses which have been offered in the past on orthodontia. It is of general knowledge that the teaching of orthodontia, adequately, is one of the biggest problems which the executives and the authorities of dental schools have had to meet, and, in some instances, has been very discouraging to the schools for the reason that the teaching of orthodontia in itself is a highly specialized activity requiring time, experience, infinite detail (both mechanically and theoretically) in the practical working out of the problem. Most dental schools have not set aside sufficient hours for this subject. The very nature and character of orthodontia make it difficult to teach to undergraduate dental students.

At the meeting of the orthodontic section of the Chicago Dental Society last February, a great deal of interest was shown by the general practitioner in the subject of orthodontia and its development. In fact, it is said they dominated the meeting. This is interesting because it shows progress; it shows that orthodontia is rapidly becoming important in the practice of many men and is destined to be more comprehensive in the future.

NEWS AND NOTES

Pacific Coast Society of Orthodontists

The 1932 meeting of the Pacific Coast Society of Orthodontists is just around the corner. It is to be held February 15, 16, and 17, at the Palace Hotel, San Francisco.

The program has been in preparation for a year and a half, and the theme of the meeting this year is to be growth and development.

Dr. Samuel J. Lewis of Detroit will present the subject. At the Merrill and Palmer School, infants from nine to eighteen months of age are taken for the five school days of each week, and are kept at the school all day. The children are studied by different specialists of the medical profession. They are weighed, measured, x-rayed, and records are kept of their growth and development. Dr. Lewis has been making plaster casts of the children's mouths when they first come into the institution and rechecking each child each year thereafter. About a year ago Dr. Lewis started a new research which is being financed by the Children's Fund of Michigan, and among other things he has added radiographic surveys of the teeth and jaws to the regular check-up.

In order to relate the subject of growth and development to treatment, an equally prominent guest speaker, Dr. Herbert A. Pullen, of Buffalo, is to be present. Dr. Pullen is a genius in his knowledge and development of appliances. Not only will he give a group of lectures but he will also present a table clinic on Wednesday afternoon, when he will show the new development in instruments and appliances.

Dr. Lischer and Dr. Orton will present the results of their original research on the relation of the mandible to the maxilla. In this connection will be shown the film on "Physiology of Mastication," which was shown at the national meeting in Memphis.

Dr. James D. McCoy and Dr. John R. McCoy will show a motion picture film on "Dentofacial Reproductions."

Dr. John Marshall will have his work in such shape that he can give some very important deductions not possible before. Few realize the scope of Dr. Marshall's research. It has already gone far beyond Oppenheim's work and is destined to be the outstanding contribution to our knowledge in biophysics.

Dr. Hawkins of the University of Southern California who has done some fine work in nutrition in connection with caries and pyorrhea, will apply his specialty to the field of orthodontia in the line of bone development.

The following men will appear on the literary program of this meeting: Dr. Herbert A. Pullen, Buffalo, N. Y.; Dr. Samuel J. Lewis, Detroit, Mich.; Dr. Albert H. Ketcham, Denver, Colo.; Dr. F. H. Orton, University of California, San Francisco, Calif.; Dr. B. E. Lischer, University of California, San Francisco, Calif.; Dr. James D. McCoy and Dr. John R. McCoy, Los Angeles, Calif.; Dr. John Marshall, University of California, San Francisco, Calif.; Dr. B. Frank Gray, San Francisco, Calif.; Dr. Harold F. Hawkins, University of Southern California, Los Angeles, Calif.; Dr. Robert Dunn, San Francisco, Calif.; Dr. Allen E. Scott, San Francisco, Calif.; Dr. Harry L. Morehouse, Spokane, Wash.; Dr. C. M. McCaulley, Los Angeles, Calif.; Dr. Percy Norman Williams, Tucson, Ariz.; Dr. Frederick Schubert, San Francisco, Calif.; Dr. W. R. Dinham, Seattle, Wash.; Dr. Carl Engstrom, Sacramento, Calif.

Any member who wishes to submit a clinic should communicate with the chairman of his section, Dr. Paul Lewis in the North, Dr. Hays N. Nance in the South, and Dr. Allen Scott in San Francisco.

The social side of the conference is being carefully planned. The entertainment committee is to have charge of receiving and entertaining the visitors. A fine banquet is also being planned.

DR. HARVEY A. STRYKER, President,
First National Bank Building,
Santa Ana, Calif.
DR. FRANK TAYLOR, Chairman Program Committee,
509 First National Bank Building,
Pomona, Calif.

Psi Omega to Celebrate Fortieth Anniversary

In commemoration of the fortieth anniversary of the founding of Psi Omega Dental Fraternity in Baltimore, during the winter of 1892, Oriole Alumni Chapter and Phi-Alpha Active Chapter will hold an anniversary celebration at the Lord Baltimore Hotel, on Saturday, April 16, 1932.

All Psi Omegas are invited to attend. The banquet charge will be five dollars per cover, and reservations can be made through

ALEXANDER H. PATERSON, General Chairman,
Medical Arts Building,
Baltimore, Md.

The Dental Hygienists Association of the State of New York

The Dental Hygienists Association of the State of New York will hold its twelfth annual meeting, May 11 to 13, 1932, at the Centennial Hall, Albany, N. Y.

A cordial invitation is extended to all members of the dental profession, dental hygienists, and dental assistants.

BLANCHE A. DOYLE, President,
100 West 59th Street,
New York, N. Y.

Society for the Advancement of General Anesthesia in Dentistry

The next meeting of the Society for the Advancement of General Anesthesia in Dentistry will be held at the Essex House, 160 West 59th Street, New York City, Monday evening, February 29, 1932.

The meeting will open with a dinner at 7 P.M., and the scientific session will begin at 8 P.M.

James T. Gwathmey, M.D., Professor of Anesthesia at the Dental School of New York University will present a brief talk illustrated with lantern slides depicting "The History of Anesthesia," and will give the advantages of premedication in anesthesia.

Harry M. Moss, D.D.S., Clinical Professor of Oral Surgery, Department of General Anesthesia, Dental School of New York University, will talk on "The Management of Difficult Patients Under General Anesthesia for Dental Operations."

This society meets four times a year in New York City, and membership is open to all members of the American Dental Association and members of the American Medical Association.

Reservations for the dinner should be made with

DR. M. HILLEL FELDMAN, President,
730 Fifth Avenue,
New York, N. Y.

The Eastern Association of Graduates of the Angle School of Orthodontia

On January 26, 1931, a Memorial Meeting was held for the late Edward Hartley Angle. The series of seven papers read at the meeting has been printed, and now appears in book form. Those who wish to obtain a copy are requested to write the secretary for further information.

B. W. WEINBERGER, Secretary,
119 West 57th Street,
New York, N. Y.

The Dental Society of the State of New York

The Dental Society of the State of New York will hold its sixty-fourth annual meeting May 11, 12, 13, 1932, at Hotel Ten Eyck, Albany, New York. A cordial invitation is extended to all members of state societies, Canadian societies and ethical dentists.

The officers and committees will present a program which we trust will enlist the attention of all dental practitioners.

Dr. E. J. Burkhart, 800 East Main Street, Rochester, N. Y., is Chairman of the Program Committee; Dr. E. W. Briggs, 1116 Madison Avenue, Albany, N. Y., Chairman of the Exhibits Committee; and Dr. E. Burley, 80 Fourth Street, Troy, N. Y., Chairman of the Clinics Committee.

For further information address the Secretary.

DR. A. P. BURKHART, Secretary,
57 E. Genesee St.,
Albany, N. Y.

Virginia—West Virginia Joint Meeting

The next annual meeting of the Virginia State Dental Association and the West Virginia State Dental Society will be held jointly at Winchester, Va., May 16, 17, 18, 1932.

Preliminary plans are well under way, and one of the largest and most interesting meetings ever held in the South Atlantic Section is predicted by the officers. Members of the American Dental Association are cordially invited to attend.

DR. R. B. SNAPP, General Chairman,
Winchester, Va.

Notes of Interest

Dr. Stephen C. Hopkins announces the removal of his office in January to 1726 Eye Street, N. W., Washington, D. C. Practice limited to orthodontia.

Dr. Edward Mason Griffin is now located at 104 East Fortieth Street, New York City. Practice limited to orthodontia exclusively.